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GOODELL'S

POCKET

ANATOMY.

BY

FRANK WISE GOODELL, M. D.,

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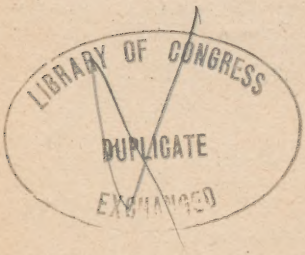

Introduction.

I wrote this little book in 1880 for my own convenience, and carried it in my pocket constantly ever since. I have now resolved to have it printed, knowing that whoever may take advantage of its concentrated matter will be benefitted thereby. So, from the medical rostrum "GOODELL'S POCKET ANATOMY" bows to the profession. It has good credentials, and though not pretentious, it asks to be your companion while larger volumes lie cold on the shelf, waiting to be consulted. While in the buggy, in the office, at home, or waiting for the pains to grow stronger, you may consult this quintessence of Anatomy, and the student who learns the contents of this little book will obtain the Anatomy prize, and be equipped for the profession as few are.

Fraternally,

FRANK WISE GOODELL, M. D.

Effingham, Ill., December 1895.

GOODELL'S POCKET ANATOMY.

ANATOMY is the science of the structure of the human frame. It is necessary that some unyielding substance should uphold and protect the softer parts of the body, and this want is admirably filled by *bone*. The *human skeleton* is composed of two hundred bones. Their science is called *Osteology*. Bone is composed of an organic, and an inorganic substance. The former consists of gelatin and blood vessels 33.30%. The latter of Phosphate of Lime 50.04, Carbonate of Lime 11.30, Fluoride of Calcium 2.00, Phosphate of Magnesia 1.16, Soda and the Chloride of Sodium 1.20%. *Bones* are divided into four classes—Long, Short, Flat and Irregular. The *Long* bones are the Clavide, Humerus, Radius, Ulna, Femur, Tibia, Fibula, Metacarpal, Metatarsal, and Phalanges. The *Flat* bones are the Occipital, Parietal, Frontal, Nasal, Lachrymal, Scapula, Vomer, Ossa Innominata, Sternum, and Ribs. The *Mixed* bones are the Vertebræ, Sacrum, Coccyx, Temporal, Sphenoid, Ethmoid, Superior Maxillary, Inferior Maxillary, Palate, Inferior Turbinated and Hyoid. The *Short* bones are the Carpus and Tarsus. *Ossification* in the fœtus takes place as follows: Second month, Clavicle, Inferior Maxillary, Vertebræ (they are formed by three Primary cartilaginous portions, one for the body, and one for laminia and its processes). Humerus, Femur, Ribs and Cartilaginous portion of

Occipital bone. At the end of the second, and commencement of the third month, the Parietal, Frontal and Sphenoid. *Third month*, Metatarsus, Metacarpus, and Phalanges. *Fourth month*, Iliac, Malleolus, Incus and Stapes. *Fourth and fifth month*, Ethmoid, Sternum, Pubes and Ischium. *Sixth to the seventh month*, the Calcaneum and Astragulus. *Eighth month*, the Hyoid bone. *At birth* the bones remaining *unossified* are the Carpus, five smaller ones of the Tarsus, Petella, Sesamoid bones, last pieces of the Coccyx, Epiphyses of the Cylindrical bones, with occasional exception of those of the Femur and Tibia. From birth to the fourth year osseous nucle make their appearance in these parts, at twelve years in the Pisiform bone. At the thirtieth year the Vertebræ are completely ossified.

The Spine is a flexous column, composed of thirty-three bones, piled one on top of the other. Each separate piece is called a Vertebræ. They are divided into five classes. Named from above downward, they are Cervical, Dorsal, Lumbar, Sacral, and Coccygeal, the first containing seven, the second twelve, the third five, the fourth five, the fifth four Vertebræ. The essential parts of a Vertebra are the body (the anterior solid segment), and a posterior part, the Arch, which is composed of two pedicles, two laminia, supporting four articular, two transverse, and one spinous process. In the adult the five bones of the fourth division of the spine unite, forming one solid bone—the Sacrum. The four

bones of the last division also unite, forming one bone—the Coccyx. The remaining upper Vertebræ remain separate through life. The first Cervical Vertebræ, or Atlas, supports the skull. It has no body, and for its articular surfaces has two latteral masses. In shape it resembles the slide or fifth wheel of a buggy. The second Cervical, or Axis, has a projection upward of its body that is called the Odontoid process, which, projecting upward, fills the space unoccupied by the body of the Atlas. It gives attachment to the ligamentum suspensorium, transverse ligament, the Odontoid or check ligaments, and a concave surface which articulates with the Atlas. The seventh Cervical Vertebræ is distinguished by its long and prominent spinous process. These last three mentioned Vertebræ are the peculiar Cervical. Each Cervical Vertebra may be distinguished by a foramen in its transverse process. Each *Dorsal Vertebra* may be distinguished from others by their bodies having facets or half facets for the heads of the ribs. The *Lumbar Vertebræ* are distinguished by their lack of the facets and absence of the foramen in their transverse process.

The Cranium consists of eight bones, the Occipital, (at base and posterior of the skull,) two Parietal (at side of skull), Frontal, forming the "forehead," two Temporal, (around the ear), Sphenoid (at base of skull,)and Ethmoid, at base of skull, between the orbits.

The Face consists of fourteen bones—the two Nasal, two superior Maxillary, two Lachrymal, two Malar, two Palate, two infe-

rior Turbinated, Vomer and inferior Maxillary. The principal objects of interest in the Temporal bone are the depression for the Casserian Ganglion, Glenoid Fossa for the reception of Condyle of the lower jaw, opening for the smaller Petrosal nerve, Hiatus Fallopii, eminence for the Semicircular Canals, Meatus Auditorius Internus, depression for the Dura Mater, and the Aquæductus Vestibuli. Principal *objects of interest* in the petrous portion of the Temporal bone are the Auricular Fissure, Jugular Fossa, Stylo Mastoid Foramen, Styloid Process, Vaginal Process, Jugular Fossa, canal for Arnold's nerve, Aquæductus Cochleœ, canal for Jacobson's nerve, opening of Carotid canal, rough Quadrilatteral surface, canal for Eustachian Tube and Tensor Tympani muscles.

The Sphenoid bone is situated at the base and anterior portion of the skull. It binds all the bones of the head together. It resembles a bat with extended wings. Its objects of interest are, principally, the Foramena Spinosum, Ovale, Vesalii, Rotundum, Lacerium, and Opticum, the Sphenoidal Fissure, posterior Clinoidal Process, middle Clinoid Process, groove for the Olfactory nerve, Ethmoidal spine, Optic groove, Ollivary Process, Sella Turcia, and Cavernous groove. To maintain the comparison, the bone is described as a body, with greater and lesser wings.

The Sphenoidal Spongy bones are thin, small plates, curved, and are joined to the Sphenoid bone usually in the adult.

The Ethmoid bone, porous, spongy and

light, is situated above the nose, at the base of the skull. It assists in forming the cavity of the orbit and nose. It consists of a horizontal plate, a perpendicular plate, and two latteral masses, the latter consisting of a number of cavities, called the ethmoid cells. It articulates with fifteen bones.

The Nasal bones, by their union, form the nose. Each presents four borders and two surfaces.

The Occipital bone, trapezoid in form, is situated at the back and base of the skull. Its external surface convex, presents as its most important points, the Basilar Process, Condyles for articulation with the Atlas, (shaped like the human ear)Foramen Magnum, which transmits the Medulla Oblongata and its membranes, Spinal Accessory nerves, Vertebral arteries, anterior and posterior Spinal arteries, and the Occipito-Axial ligament, Jugular process, anterior and posterior Condyloid Foramen, inferior and superior Curved lines, and the Occipital Protuberance. Its inner surface is deeply concave and is divided into four Fossa by a crural ridge. The two superior receive the Occipital lobes of the Cerebrum, the two inferior Fossæ receive the hemisphere of the Cerebellum.

The Parietal bones form, by their union, the sides and roof of the skull, each bone presenting for examination two surfaces, four borders and four angles. Near the upper edge a little posterior to its middle is the Parietal Foramen. A fullness at about the middle of the bone is called the Parietal Emi-

nence, and below this are the two temporal ridges, upper and lower. Its inner side, concave, is marked with groovings for the middle Meningeal Artery. Near its anterior superior angle are the Pacchonian depressions.

The Os Frontis, or forehead, presents for examination the nasal spine, internal angular process, supra-orbital foramen, superciliary ridge, remains of frontal suture, and the frontal eminence. Internally, the bone presents an orbital plate, frontal sinus, Meningeal grooves, and Pacchonian depressions. The frontal bone protects the Cerebrum in front.

The Superior Maxillary bone is the largest bone of the face, except the lower jaw. Each bone forms part of the wall of the nasal cavity, roof of the mouth, and floor of the orbit, and Spheno-Maxillary and Zygomatic fissures. It has a body and four processes—the malar, nasal, alveolar, and palatine. Its principal objects of interest are the alveolar process, incisor fossa, Maxillary tuberosity, posterior dental canals, Infra orbital grooves, nasal process, lachrymal tuburcle, canine fossa, anterior palatine canal, nasal spine, posterior palatine canal, palate process, and the inferior turbinated crest.

The Lachrymal bones are the most fragile bones of the face. They are squamous, resembling a finger nail, and situated at the front and inner wall of the orbit.

The Malar bones, or cheek bones, are situated at the upper and front part of the face. They form part of the orbital wall, and the Temporal and Zygomatic fossa. Each has

four processes, the frontal, orbital, maxillary, and Zygomatic. It has four borders.

The Palate bones assist in forming the roof of the mouth, floor of the orbit, and nasal cavity, and three fossa, the Zygomatic, Spheno-Maxillary, and Pterygoid.

The Inferior Turbinated bones, situated on the outer wall of the nasal fossa, are thin and fragile, and rolled upon themselves like a scroll. They are situated below the antrum and extend across the outer wall of the nasal fossa.

The Vomer—one bone—is situated at the back part of the nasal fossæ, forms part of the septum of the nose. On each side is the naso-palatine groove, which transmits the naso-palatine nerve.

The Inferior Maxillary bone is the longest and largest bone of the face, and holds the lower teeth. It consists of a body and rami. Its objects of interest are the mental process, Symphisis, external oblique line, groove for the facial artery, mental foramen, condyle, coronoid process, sigmoid notch, alveolar process, and fossa for the sublingual gland.

Suture is the name given to the dovetail fastenings of the bones of the cranium and face. They are the sagittal (or interparietal), coronal (or fronto-occipital), lambdoid (or occipito-parietal), spheno-parietal, squamo-parietal, masto-parietal, basilar (formed by the basilar surface of the occipital bone, with the posterior surface of body of sphenoid), petro-occipital, masto-occipital, petro-sphenoidal, transverse suture (formed by the frontal bone

and the malar, sphenoid, ethmoid, lachrymal, superior maxillary, and the nasal bones), masto-occipital, petro-sphenoidal, and squamo-sphenoidal.

For convenience of description *The Skull* is divided into five regions—the superior region, or vertex; inferior region, or base; two latteral, and an anterior region, the face.

The Orbits are two cone-shaped cavities at the base and anterior part of the skull, and upper and anterior part of face, situated with the expanded portion outward and forward, their apices inward and backward. Their walls are formed by the frontal, sphenoid, ethmoid, superior maxillary, malar, lachrymal and palate bones. The orbits contain the eye-balls, which they admirably protect.

The Oss Hyoides, or lingual bone, supports the tongue, and gives attachment to its muscles.

The Thorax is an osseo-cartilaginous cage, which protects the heart and lungs. It receives its support from the dorsal verterbræ situated posteriorly, in front it is held together by the Sternum. Its sides are formed by the ribs.

The Sternum is a thin, flat bone, composed of three segments. From above downward they are the manubrium, gladiolus, and ensiform appendix.

The Ribs are elastic arches of bone, twenty-four in number, twelve on each side. They are attached posteriorly to the vertebræ, eight fixed and four floating. They form the sides of the chest.

The Clavicle, or collar bone, forms the upper part of the shoulder, situated at the upper part of the chest. It gives attachment to the deltoid muscle. Is flat on its upper border. In the female it is smoother, lighter and less curved than in the male. It is quite elastic.

The Scapula, or "shoulder blade," forms the back part of the shoulder. It is a large, thin, flat bone, bluntly triangular, presents three borders, two surfaces and three angles. Its Coracoid process, and Accromian process assists in the formation of the upper part of the shoulder joint, both giving attachment to important muscles.

The Humerus is the longest, largest bone of the upper extremity. It consists of a shaft, and two extremities. The upper extremity is expanded spherically, forming the head of the humerus, which, articulating with the glenoid cavity, forms the shoulder joint. A slight groove around its center, is designated the anatomical neck, a constriction below the tuberosities, is appropriately and suggestively named the *surgical neck*.

The greater and lesser *Tuberosities* are large accumulations of bone on the outer and inner side, and upper part of the Humerus, for the insertion of muscles. The shaft is cylindrical, connecting the two extremities. The lower extremity is enlarged and flattened. Its outer surface, called the outer condyle, the inner, the inner condyle. The space between them articulating with the Radius and Ulna, constitutes the elbow joint, the Ulna ar-

ticulating with the trochlea, the Radius with the radial head of the humerus. Immediately above the former is the coronoid depression and above the latter is the Radial depression. The Humerus is the bone of the arm.

The Ulna is a long, three sided bone, extending from the condyle of the humerus to the carpal bones, from which it is separated by the inter articular fibro-cartilage. Its objects of interest are, at upper part, olecranon process, coronoid process, greater and lesser sigmoid cavities for articulation, the latter with head of the radius, the former with the trochlear surface of the humerus. The Shaft is divided into an anterior, posterior, and external border, and an anterior, posterior and internal surface. Its lower extremity is small and does not participate in the formation of the wrist joint.

The Radius, the outer bone of the forearm, lies parallel with the Ulna. Its upper end is small, and forms only a small part of the ginglymoid joint, while the lower end is large and forms most of the wrist joint. The upper extremity is divided into a head, neck and tuberosity, the former articulating with the lesser, or radial head of the humerus. The shaft is cylindrical, and divided into an anterior, posterior and internal border, and an anterior, posterior and external surface.

The Hand is divided into the carpus, or the wrist, metacarpus, or palm, and phalanges, or fingers. The former consists of two rows of bones. From the radial to the Ulna side the upper row are the Scaphoid, Semilunar, Cuneform, and Pisiform; the lower row are

the Trapezium, Trapezoid, Magnum, and Unciform. Each with the exception of the Pisiform presents six surfaces—an anterior or palmer, posterior or dorsal, the superior and inferior surfaces for articulation, and the internal and external surfaces. The Pisiform has a single, large facet, and is very small.

The Phalanges, or bones of the fingers, are fourteen in number for each hand, each finger three, the thumb two. They have a shaft and two extremities. The upper extremity, or base of the first row, is concave to assist articulation. The lower end terminates by two latteral condyles. The first row articulates with the metacarpal bones and the second row, and the second row with the first and third, and the third with the second row.

The Oss Innominatum, with its fellow, forms the pelvis (with the spinal column behind). It is formed by the union of the Ilium, Ischium, and Pubes, which complete their union about the twenty-fifth year.

The Ilium is the hip bone. Its external or dorsal surface presents the semi-circular lines, and great sacro-sciatic notch. The internal surface is bounded above by the crest, below by the linia ilio-pectinea, and before and behind by its anterior and posterior borders. It presents anteriorly a large smooth concave surface called the internal iliæ fassa. The upper part is called the crest and is longest in the female. It terminates in the anterior and posterior spinous process. Its anterior border gives attachment to Pourpart's ligament.

The Ischium forms the back part of the oss innominatum. It is divided into a body, and a thin ascending part—the ramus. The lesser sacro-sciatic notch is converted into a foramen which gives passage to the Obturator internus, the nerve which supplies it, and the pudic vessels and nerves. At the joining of the posterior and inferior borders is the tuberosity. The ramus is the thin, flattened part of the ishium, and ascends from the tuberosity upward and inward. Its outer border forms part of the inner margin of the obturator foramen.

The Pubes forms the anterior part of the oss innominatum, and is divided into a horizontal ramus, and a perpendicular ramus. Its outer border forms one-fifth of the cavity of the acetabulum. The brim of the true pelvis is marked by the ilio pectieal lines which cuts into the surface of the horizontal ramus. The ramus presents for examination two extremities and four borders.

The Acetabalum, or cotyloid cavity is a deep cup-shaped hemispherical depression, formed internally by the Pubes, above by the Ilium, behind and below by the Ischium—the latter forming two-fifths, the former one-fifth, and the Ilium two-fifths.

The Acetabulum has a heavy cartilaginous sack, the capsular ligament, attached to its circumfeience. It surrounds the head and attaches to the neck of the Femur. The joint is supplied by vessels which obtain entrance through the cotyloid notch. At the bottom of the cavity is situated the Ligamentum teres.

The *Obturator* or thyroid foramen, the largest foramen of the body, is situated between the Ischium and Pubes. In the female it is smaller and more round than in the male. It transmits the obturator vessels and nerves. Numerous muscles find attachment to the oss innominnatti.

The Pelvis is the cavity formed by the oss innominatti on three sides, and the spine posteriorly. The *true* pelvis is situated below the ilio-pectineal line, the false pelvis above it. The space between the ilio-pectineal line is called the inlet—the Line marks the superior circumference. The lower circumference is called the outlet. The inlet is irregularly heart shaped, and has three principal diameters—the antero, posterior (or sacropubic), the transverse and oblique. The former diameter extends from the sacro-vertebral angle, to the symphysis pubis; its measurement is four inches. The *transverse* diameter extends from one brim to the other at its greatest distance, and measures five inches. The oblique *diameter* extends from margin of pelvis, corresponding with its pectineal eminence, from one side to sacro-iliac symphysis on the opposite side; measurement, five inches. The boundary of the true pelvis is a line drawn from the inner surface of the ischium, passing through the concavity of the sacrum and coccyx and the symphysis pubis in front. Anteriorly this cavity is an inch and one-half deep, in the middle three and a half inches, and posteriorly four and a half inches. This cavity is filled with the

rectum, bladder, and part of the generative organs. In the female the middle portion is occupied by the uterus and vagina, the bladder anterior, and the rectum posterior. The diameters of the outlet are, the antero-posterior, and transverse, both measuring four inches. The plane of the inlet of the true pelvis will be represented by a line drawn from the base of sacrum, to the upper margin of the symphysis pubis. The bones of the pelvis are stronger, more massive, rougher, deeper and narrower in the male. In the *female* they are smoother, lighter and more expanded, the inlet and outlet are larger, the obturator foramen smaller and rounder. In the *fœtus* the plevis is comparatively small. At the age of puberty the characteristics of the sex assert themselves in development.

The Femur (the thigh bone) the longest, largest bone in the body, is divided into a shaft and two extremities. The upper extremity is divided into a head, neck and a greater and lesser trochanter. The head is globular, a little more than a hemisphere. It is directed upward, inward and a little backward. An oval depression near its center marks the spot of an insertion of the ligamentum teres, which holds it in the acetabulum.

The Neck, constricted, is set at an angle of thirty-three degrees on the shaft and connects it and the head. It is straighter in youth than in age. In the female it is set at nearly right angles. Numerous vascular foramena are observed on its anterior. The greater trochanter is situated at the outside

and upper part of the shaft. It is large, quadrilatteral, rough and convex. It presents for examination two surfaces and four borders.

The Lesser Trochanter is a conical shaped eminence of bone protruding from the lower and back part of the neck where it joins the shaft. The intertrochanteric line, or spiral line, runs from the summit of the great trochanter downward to the upper part of the lesser trochanter. About its middle is the linia quadrati.

The Shaft, quite cylindrical in form connects the two extremities. It is divided into three borders, separating three surfaces. The posterior border—the linia aspera—is a long longitudinal ridge, presenting an internal and external lip, and a rough intermediate space. Below it divides into two bifurcations which enclose the popliteal space on which rests the popliteal artery. The *Femoral* artery passes through a broad shallow groove in the inner branch of the linia aspera. The lower extremity is larger than the upper, flattened from before backward, has a wide, deep notch in the middle—the intercondyloid notch, on either side of which is a large accumulation of bone, named from their position—the outer and inner condyle, the former the broadest, the latter the longest and narrowest. The Femur articulates with three bones—the acetabulum above, the patella and tibia below. The lesser trochanter unites the twentieth year.

The Leg consists of the Patella, Tibia, and

Fibula. The Patella is a triangular, flat, small bone, situated in front of the knee joint. It is divided into an anterior and posterior surface, three borders, a base and an apex. The anterior surface is covered by an expansion of the tendon of the quadriceps extensor muscle. The *Tibia* is the largest bone below the Femur with which it articulates above, below with the Astragalus. Its upper extremity is large and expanded on each side into an outer, and inner tuberosity. Between them is situated the spinous process, posteriorly they are separated by the popliteal notch.

The Shaft is between the two extremities, and is triangular in form, smallest about the lower fourth. It is divided into three surfaces and three borders. Below the oblique line, is the medullery foramen. The lower posterior part of the shaft is marked by two grooves, one for the flexor longus pollicis, the outer one for the flexor longus digitorum and the tibialis posticus.

The Fibula is situated on the outer side of the leg and is smaller than its fellow. It is divided into a shaft, and two extremities, the upper or head, the lower or malleolus. The shaft is triangular, presenting three surfaces and three borders.

The External Malleolus articulates with the astragalus. Not being on a level with with the tibia above, the fibula takes no part in the knee joint. On the outer side of the head is the styloid process. The internal surface or interosseous

ridge is close to the side of the anterior border. The lower epyphysis becomes united about the twenty-fifth year.

The Foot is the terminal part of the lower extremities, and consists of three divisions, the tarsus, metatarsus and phalanges. The *Calcaneum*, or Oscalcis, is the largest and strongest of the tarsal bones. It is cuboidal in form, situated at the back of the foot, and articulates with the Tibia and Fibula. It supports the weight of the body. It presents six surfaces. Its principal objects of interest are—three articular facets, the lesser process, and a rough prominence on its anterior surface. It articulates with the Cuboid in front. The *Cuboid*, placed at the side of the foot articulates with the Calcaneum behind, and the fourth and fifth metatarsal bones. It presents six surfaces, three articular and three non-articular. It has a distinguishing deep cut for the tendon of the Pernoneus longus muscle. Its principal objects of interest are the tuberosity, convex facet, peroneal groove and a deep notch at its commencement, small facet for articulation with the external cuniform bone, and behind this a smaller facet for articulation with the scaphoid.

The Astragalus is the second largest of the tarsal bones, resting below on the Os Calcis behind the scaphoid, supports the Tibia above, articulating with the malleoli on either side, and occupies the middle and upper part of the tarsus. It presents for ar-

ticulation six surfaces, the superior surface articulating with the Tibia.

The Scaphoid, or navicular bone, is situated behind the two Cuniform bones at the outer surface of the foot in front of the Astragalus. It has three facets in front and is deeply concave behind. Its internal surface presents the tuberosity of the Scaphoid. The external surface presents occasionally a small facet for articulation with the Cuboid bone.

The Internal Cuniform bone is situated at the inner side of the foot, between the Scaphoid behind, and the base of the first metatarsal in front. It is irregularly wedge-shaped and presents six surfaces, the inner being subcataneous and forms the inside of the foot. It articulates with four bones—the Scaphoid, middle Cuniform and the first and second metatarsal bones.

The Middle Cuniform Bone is situated between the first and third Cuniform bones, behind the second Metatarsal bone and in front of the Scaphoid. It is irregularly wedge-shaped, its base or superior surface is posterior.

The External Cuniform bone, shaped like the preceding, is situated with its base upward, behind the third Metatarsal bone, in front of the Scaphoid, internal to the Cuboid, and external to the middle Cuniform. It presents six surfaces, the posterior articulating with the most external facet of the Scaphoid. The internal surface presents two articular facets—the external surface the same.

The Metatarsal Bones, five in number, are classed among the long bones and divided into a shaft and two extremities, situated between the tarsal bones and phalanges, slightly concave below, convex above. The posterior surface is wedge-shaped, the anterior end is rounded. A deep groove on its under or expanded side, is to accommodate the passage of the tendon of the flexor muscle.

The Phalanges of the Foot are the bones of the toes, fourteen in number, three in each but the first, internal or great toe, which has but two. The first row articulates with the metatarsal bones posteriorly, the second row of phalanges anteriorly. The second row articulates with the first and third rows, except that of the great toe, which terminates. They are shorter, but broader than those of the first row. The third row has a broad base for articulation, and an expanded extremity for the support of the nail and the end of the toe. They articulate with the second row.

The Sesamoid Bones are cartilaginous in early life, osseous in after life, and are developed in the fibrous tissue of a tendon. They are the patella, two small bones found opposite the metatarso—phalangeal articulation of the great toe in each foot, occasionally in the same joint of the second toe, the little toe, and more rarely in the third and fourth toes. Two in the metacarpo—phalangeal articulation of the thumb—in the palmar surface. Occasionally one or two opposite the same articulations of the fore and little

fingers, more rarely—one on the third and fourth fingers—one over the groove in the Cuboid bone, one over the internal facet of the internal Cuniform bone appearing late in life. One opposite the inner side of the Astragulas, one behind the outer condyle of the Femur, one developed in the Psoas and Iliacas (where they glide ever the Pubes,)one is occasionally found opposite the tuberosity of the Radius,one in the tendon of the Gluteus maximus as it passes over the greater trochanter, and one in the tendons which wind round the inner and outer Malleoli.

Articulations, or joints, are the connections of bones. The structures which enter into the formation of a joint are bone, cartilage, fibro-cartilage, ligament and synovial membrane.

Immovable joints have between their surfaces a thin layer of fibrous membrane called the sutural ligament. Fibro-cartilage is also situated between the edges of articulations where slight motion is required. In joints where great mobility is expected the bones are padded with elastic cartilage and lined with synovial membrane which secretes a lubricating fluid. The bones are held together by strong ligamentous bands. The layer of compact bone which forms the articular surface, and gives attachment to the cartilage, is called articular lamella.

Cartilage is firm, pearly white, sometimes yellow, yielding to pressure, regaining its shape when the pressure is removed, elastic and flexible. It forms the original frame

work of man, afterward undergoing ossification. This is called temporary cartilage in contradiction to permanent cartilage which is not prone to ossification. Cartilage is divided into articular, costal, reticular, fibro, interarticular fibro or menisci, connecting fibro, circumferential fibro, and stratiform fibro cartilage.

Arthrology, anatomy of the joints. The articulations are divided into three classes—first, synarthrosis (or immovable); second, ampiarthrosis (or mixed), and third, diarthrosis or movable joints. The first variety is subdivided into Satura, Schindylesis, Gomphosis, Satura dentata, Satura serata, S. Lymbosa, S. Notha, S. Squamosa and S. Harmonia. The Diarthrosis are divided into Arthrodia, Enarthrosis, Ginglimus and Diarthrosis Rotatorius. Joints admit of four varieties of motion, gliding, angular, circumduction and rotation.

Syndesmography, anatomy of the ligaments. Ligaments of the vertebræ are divided into five sets. Those connecting the bodies of the vertebræ, those connecting the laminæ, those connecting the articular processes, those connecting the spinous processes, those connecting the transverse processes. The ligaments of the articulation of the atlas with the axis are two anterior atlo-axoid, and the posterior atlo-axoid, the transverse and two capsular. The ligaments of the articulation of the atlas with the occipital bone are, two anterior occipito-atloid, posterior occipito-atloid, two latteral occipito-atloid and two

capsular. Ligamets of articulation of the Axis and Occipital bone are occipito-axoid and three odontoid. Lig. of the Temporo Maxilliary articulation are the external and internal latteral, Stylo-Maxilliary, capsular and inter-articular fibro-cartilage. Lig. of the head of the ribs and bodies of the vertebræ are the anterior costo-vertebral or stellate, capsular and inter-articular. Lig. of the articulation between the neck and tubercle of the ribs with the transverse processes are, anterior costo-transverse, middle costo-transverse, posterior costo-transverse and capsular. Lig. connecting the cartilages of the ribs, with the sternum are the anterior costo-sternal, posterior costo-sternal and capsular. Lig. connecting the last lumbar vertebra with the sacrum are anterior and posterior common ligaments, intervertebral substance, ligamenta sub-flava, capsular, interspinous and super-spinous. Lig. of the Sacrum and Ischiatic articulation are, greater or posterior sacro-sciatic, and lesser or anterior sacro-sciatic. Those of the sacrum and coccyx are, anterior sacro-coccygeal, posterior sacro-coccygeal, and inter-articular fibro- cartilage. Lig. of the articulation of the Pubes are anterior, posterior, and superior pubic, sub-pubic, and inter-articulor fibro-cartilage. Lig. of the Sterno-Clavicular articulation are, anterior sterno-clavicular, posterior sterno-clavicular, inter-clavicular, costo-clavicular or rhomboid, and inter-articular fibro-cartilage. Lig. of the Scapulo-Clavicular articulation are the superior acromio-clavicular, in-

ferior acromio-clavicular, trapezoid, conoid and inter-articular fibro-cartilage. Lig. of the shoulder joint are the capsular, coraco-humeral and glenoid. Lig. of the Elbow Joint are, anterior, posterior, internal and external latteral. The Radio-Ulnar articulation has but one ligament, the annular, or orbicular. Lig. of the middle Radio-Ulnar articulation are the oblique and interosseous. Lig. of the inferior Radio-Ulnar articulation, anterior Radio-Ulnar, posterior Radio-Ulnar, and the triangular inter-articular fibro-cartilage. Lig. of the wrist joint are, the external latteral, internal latteral, anterior, and posterior. Lig. of the first row of Carpal bones are, two Dorsal, two palmar, and two interosseous. Those of the second row are, three dorsal, three palmar, and two interosseous. Lig. of the two rows of carpal bones with each other are, anterior or palmar, posterior or dorsal, external latteral, and posterior latteral. Lig. of the corpo-metacarpal articulation are the dorsal, palmar and interosseous. Cartilages of the larynx are Thyroid, Cricoid, Epiglottis, two Arytenoid, two Cornicula Laryngeis and two Cuniform.

Ligaments of the Carpo-Phalangeal articulation are the anterior and two latteral. Ligaments of the articulation of the phalanges are the anterior and two latteral. Ligaments of the hip joint are the capsular, ilio femoral, teres, cotaloyd and transverse. External ligaments of the knee joint are anterior or ligamentum patella, posterior or ligamentum posticum Winslowii, internal latteral,

two external latteral and capsular. The internal ligaments are the anterior or external crucial, posterior or internal crucial, two semilunar fibro-cartilages, transverse, coronary, ligamentum mucosum, and ligamentum alaria. Ligaments of the Superior Tibio-Fibular articulation are the anterior superior tibio-fibular, and posterior superior tibio-fibular.

The Ligament of the middle tibio--fibular articulation is an interosseous membrane between the contiguous margins of the tibia and fibula. It is perforated for the passage of the anterior tibial artery, the anterior peroneal vessels, and numerous perforations for the passage of smaller vessels. Ligaments of the inferior tibio-fibular articulation are the inferior interosseous, anterior inferior tibio-fibular, posterior inferior tibio-fibular and transverse. Ligaments of the Ankle joint are the anterior, internal latteral, and external latteral. Ligaments of the articulation of the first row of tarsal bones are the External Calcaneo-Astraguloid, Posterior Calcaneo-Astraguliod, and Interosseous. Those of the second row are Dorsal, Plantar and Interosseous. Ligaments of the two rows of the Tarsus with each other are the Superior Calcaneo-Cuboid, Internal Calcaneo-Cuboid, Long Calcaneo-Cuboid, and Short Calcaneo Cuboid. Ligaments connecting the Os Calcis with the Scaphoid are the Superior Calcaneo-Scaphoid and the Inferior Calcaneo-Scaphoid. Ligaments of the Tarso-Metatarsal articulation are Dorsal, Plantar and Interosseous. Ligaments of the same name hold the Meta-

carpal bones to each other. Ligaments of the Metatarso-Phalangeal articulation are the anterior or palmar, and two latteral. Ligaments of the Phalanges of the foot are the same as those of the hand.

Myology--Anatomy of the Muscles--Muscles and Fasciae. Muscles are bundles of reddish fibres, composed principally of fibrin and endowed with the power of contractility at the dictation of the will, with the exception of the involuntary muscular fibres which act during sleep and unconsciousness and are not under the control of the will. Those under control of the will are designated by their striped appearance and are classed as voluntary muscles, the unstriped being the involuntary muscles. The smaller bundles of fibres are massed together and surrounded by a thin sheath which serves as a protection, and enables one muscle or set of muscles to glide over another in motion, without friction. The smallest fibril of a muscle is shaped like a string of beads—the beads or enlargements are called the Sarcous elements. By the contraction of a muscle motion is produced—the point of the greatest mobility where the muscle is attached is called its location of insertion, the most fixed part is called its point of origin. In the greater number of examples a muscles may be made to act from either extremity. Tendons are white, glistening structures which are connected to the ends of muscles and form their attachment, insertion and origin. They are strong, small, smooth, unyielding, and capable of sustaining great

weight. The Fascia are fibro-areolar, or aponeurotio laminae, which surround the soft and delicate organs of the body. It is divided according to the position it occupies into superficial or fibro-areolar fascia, and deep or aponeurotic fascia. The former is found nearly all over the body, beneath the integument, connecting the skin with the deep or aponeurotic fiascia, and consists of fibro-aeolar tissue. The aponeuratic tissue is strong, inelastic membrane which forms sheaths for the muscles, and surrounds them collectively, also giving covering to vessels and nerves.

Muscles.—After becoming familar with the names of muscles, and the regions to which they belong, it is comparatively easy to learn their origin and insertion. It is important to remember that their names are descriptive and suggestive.

Muscles in the Epicranial region are the occipito-frontalis. In the Auricular region the attollens aurum, atrahens aurum and retrahens aurum.

Palpebral Region.—Orbicularis palpebrarum, corrugator supercilii, tensor tarsi, levator palpebrae. Orbital Region, Levator Palpebæ, rectus superior, rectus inferior, rectus internas, rectus externus, obliquus superior, obliquus inferior.

Nasal Region.—Pyrmadalis nasi, levator labii superoris alaeque nasi, dilator naris posterior, dilator naris anterior, compressor naris, compressor narium minor, and depressor alae nasi.

Superior Maxillary Region.—Levator labii superioris, levator anguli oris, zygomaticus major, and zygomaticus minor.

Inferior Maxillary Region.—Levator labii inferioris, depressor labii inferioris, depressor anguli oris.

Inter-Maxillary Region.—Bucinator, Risorius, and orbicularis oris.

Temporo-Maxillary Region. — Masseter and temporal. Muscles of the Pinna are helicus major, helicus minor, tragicus, antitragicus, transverse auriculae, and obliquus oris.

Pterygo-Maxillary Region.—Pterygoideus externus, and Pterygoideus internus.

Cervical Region.—Platysma myoides, and sterno-clido mastoid.

Infra Hyoid Region.—Sterno-thyroid, sterno-hyoid, thyro hyoid, omo-hyoid.

Supra Hyoid Region.—Digastric, stylo-hyoid, mylo-hyoid, genio-hyoid.

Lingual Region.—Genio-hyo-glossus, hyo-glossus, stylo-glossus, Palato glossus.

Pharynx.—Constrictor inferior, constrictor superior, constrictor medius, stylo-pharyngeus, palato-pharyngeus.

Soft Palate.—Levator palati, tensor palati, azygoz uvulae, palato-glossus, palato-pharyngeus.

Muscles of the Back are, first layer, Trapezieus, Latissamus Dorsi, and second layer, Levator Anguli Scapulae, Rhomboides Major, Rhomboides Minor. Third layer, Seratus Posticus Superior, Seratus Posticus Inferior, Splenius Capitus, Splenius Colli. Fourth layer,

Erector Spinae, Sacro Umbalis, Musculus Accessorius ad Sacro Lumbalum, Longissimus Dorsi, Cervacilis Ascendens, Trachelo-Mastoid, Complexius, Biventor Cervices, Spinalis Cervices. Fifth layer, Semi Spinalis Dorsi, Semi-Spinalis Colli, Multifidius Spinae, Rotatores Spinae, Supra Spinales, Interspinales, Extensor Coccygis, Intertransversales, Rectus Posticus Major, Rectus Posticus Minor, Obliquus Superior, Obliquus Interior.

Muscles of the Larynx are, Crico-Thyroid, Crico-Arytenoideus Posticus, Crico-Arytenoideus Latteralis, Crico-Arytenoideus, and Thyro-arytenoideus.

Muscles of the Thorax are, Intercostales Externi, Inter-Costales Interni, Infra-Costales, Triangularis Sterni, and Levatores Costarum.

The Diaphragm is a thin, strong, fan-shaped muscle, extending across the body, separating the abdomen from the thorax. It possesses the dual power of voluntary and involuntary action. Anteriorly it is attached to the ensiform cartilage, on the sides to the sixth or seventh inferior ribs. Posteriorly it is attached to the lumbar vertebrae by the ligamentum arcuatum externum and ligamentum arcuatum internum. The Diaphragm is perforated by numerous apertures —three of large size—the Aortic, Oesophageal, and opening for the Venae Cava. It is supplied by the Phrenic nerve. It takes a most important, necessary and active part in respiration, and in all expulsive acts.

Muscles in the Anterior Vertebral Region are Rectus Anticus Capitus Major, Rectus

Anticus Capitus Minor, Rectus Latteralis and Longus Colli.

Muscles of the Latteral Vertebra Region are Scalenius Anticus, Scalenius Posticus, Scalenius Medius.

Muscles of the Abdomen are Obliquus Externus, Obliquus Internus, Transversalis, Rectus, Pyrmadalis and Quadratus Lumborum.

Muscles of the Anterior Thoracic Region are Pectoralis Major, Pectoralis Minor and Subclavius.

Latteral Throacic Region. — Seratus Magnus.

Accromial Region.—Deltoid.

Anterior Scapular Region.—Sub-Scapularis.

Posterior Scapular Region.—Supra Spinatus, Infra Spinatus, Teres Major, Teres Minor.

Anterior Humeral Region.—Coraco-Brachialis, Biceps and Brachialial Anticus.

Posterior Humeral Region.—Triceps and Sub-Anconeus.

Anterior Brachial Region. — Pronator Radii Teres, Flexor Carpi Radialis, Palmaris Longus, Flexor Carpi Ulnaris, Flexor Sublimus Digitorum, Flexor Profundus Digatorium, Flexor Longus Pollicis and Pronator Quadratis.

Radial Region.—Supinator Longus. Ex-Tensor Carpi Radialis Longior, Extensior Carpi Radialis Brevior.

Posterior Brachial Region.—Extensor Communis Digitorum, Extensor Minimi Digiti, Extensor Carpi Ulnaris, Anconeus, Supinator Brevis, Extensor Ossis Metacarpi Pollicis,

Extensor Primi Internodii Pollicis, Extensor Secundi Internodii Pollicis, Extensor Indicis.

Radial Region of the Hand.—Abductor Pollicis, Flexor Ossis Metacarpi Pollicis, Flexor Brevis Pollicis, Adductor Pollicis.

Ulnar Region of the Hand.—Palmaris Brevis, Abductor Minimi Digiti, Flexor Brevis Minimi Digiti, Flexor Ossis Metacarpi Minimi Digiti.

Palmar Region.—Lumbricales, Interossei Palmares, Interossei Dorsales.

Iliac Region.—Psoas Magnus, Psoas Parous and Iliacus.

Posterior Femoral Region.—Biceps, Semi-Tendinosus, Semi-Membranosus.

Anterior Tibio-Fibular Region.—Tibialis Anticus, Extensor Longus Digitorum, Extensor Proprius Pollicis, Peroneus Tertius.

Posterior Tibio-Fibular Region.—Gastronemius, Plantaris, Popliteus, Flexor Longus Digitorum, Flexor Longus Pollicis, Tibialis Posticus.

Fibular Region.—Peroneus Longus, Peroneus Brevis.

Dorsal Region of the Foot.—Extensor Brevis Digitorum and Interossei Dorsales.

Plantar Region—Abductor Pollicis, Flexor Brevis Digitorum, Abductor Minimi Digiti, Transversus Pedis and Interossei Plantares.

Muscles of the Female Perineum are Sphincter Vagina, Erector Clitorides, Transversus Perinei, Compressor Urethrae, Sphincter Ani, Levator Ani, and the Coccygeus.

Muscles of the Male Perineum are Accelerator Urinae (on each side of the middle

line), Erector Penis, and Transversus, External and Internal Sphincter Ani.

Arteriography.—(A description of the Arteries.)—*The Arteries* are tubular, elongated, permanently open vessels, which convey the oxyginated, red blood, from the heart to every part of the body. This system of piping or tubing has its origin in the *Aorta*, which proceeds from the left ventricle of the heart and subdivides numberless times in its duty of reaching each part of the body.

The Pulmonary artery arises from the right ventricle of the heart, and carries the dark, venous blood directly into the lungs. It is returned, after its passage and purification through the lungs, to the heart by the Pulmonary veins, which open into its left auricle. This is called the lesser or pulmonic circulation.

The only exception to the distribution of Arteries is hairs, nails, epidermis, cartilages and the Cornea. The larger arteries by wise provision occupy protected positions, running along the flexor side of the limbs. There is no fixed manner of arteries giving off branches, the greatest number of examples is dichotomous, sometimes several branches are given off from a short trunk, or a trunk may give off several branches in succession. Branches of arteries are given off at various angles, they do not diminish in size as they proceed, only as branches are given off.

Anastomosis, or inosculation is very frequent between arteries of all sizes, being

found where great activity of circulation is required, as in the brain, the intestines, and around the articulations. In the smallest arteries their inosculation is numberless, forming mattings, and are called Capillaries.

Great tortuosity is observed in the arteries of the Uterus, the Fascial, Labial, Internal Carotid and Vertebral arteries. Arteries have three coats named from their position, external, internal and middle coats, like three tubes, one passed into the other. The smaller or internal one is smooth when distended, but lays in folds when the internal pressure and tension is removed. The middle coat is thicker than the internal, and consists of muscular and elastic fibres. Its yellowness and thickness increases with the size of the artery, its thinness and redness increased in smaller examples. The external, or areolar and elastic coat, is the thickest of the three and consists of connective tissue and elastic fibres. Arteries are inclosed in a thin areolar-fibro investment, attached loosely to the vessel by a delicate areolar tissue; this sheath usually incloses the accompanying vein and sometimes the nerve. Arteries of the Brain have no sheaths. All the larger vessels have a distinct circulation as though they did not contain blood. The coats of the tubing being supplied by small arteries that are a branch of the artery, or that come from some distant vessel, and minute veins carry the blood back again to the Venae Comites. The arteries supplying the artery are called the Vasa Vasorum. Nerves of the arteries are derived

chiefly from the sympathetic and partly from the Cerebro-Spinal system.

The Aorta is in the exact form of a siphon. It curves posteriorly over the heart and descends by the left side of the vertebral column to the fourth Lumbar Vertebra where it divides into the right and left iliac arteries. The curve of the Aorta is termed its arch, the Thoracic and abdominal Aorta is so-called from the cavities it passes through.

The *Brain* is supplied with blood by the Carotid arteries. The *Hand* and *Forearm* are supplied with blood by the Radial and Ulna arteries and their numerous branches. These, united in the Brachial artery, with its branches supply the arm. The Brachial terminates in the Axillary artery at the lower border of the tendons of the Latissamus Dorsi, and teres major muscles. The Axillary supplies the Thoracic muscles principally, and terminates at the lower border of the first rib in the Subclavian artery. On the right side the Subclavian artery is continued into the arteria Innominata, which comes directly from the arch of the Aorta. On the left side the Subclavian artery is continued into the transverse portion of the arch of the Aorta. The *Foot* and *Leg* receive their blood supply from the Posterior Tibial, Peroneal, and Anterior Tibial arteries and their branches. These are from the Popliteal artery. The latter with its branches supplies the parts of the thigh through which it passes, and the knee joint, abundantly with blood. The Popliteal artery at the opening in the Abductor Magnus be-

comes the Femoral artery. The latter, after giving off numerous branches, terminates beneath Pouparts ligament, in the external Iliac artery. The names of the arteries are largely descriptive and suggestive.

Branches of the Arch of the Aorta are Innominate artery, Left Carotid, Left Subclavian, Right Carotid, and Left Coronary.

Branches of the External Carotid artery are Superior Thyroid, Lingual, Fascial, Occipital, Posterior Auricular, Ascending Pharyngeal, Temporal and Internal Maxillary.

The Right Common Carotid Artery arises from the Arteria Innominata, behind the right Sterno-Clavicular articulation.

The Left Common Carotid Artery arises from the summit of the arch of the Aorta.

Branches of the Superior Thyroid Artery are the Hyoid, Superficial descending branch, Superior Laryngeal and Crico-Thyroid.

Branches of the Lingual Artery are Hyoid, Dorsalis Linguae, Sub-Lingual and Ranine.

Branches of the Facial artery are inferior or ascending Palatine, Tonsillar, Sub-Maxillary, Sub-Mental, Muscular, Inferior Labial, Inferior Coronary, Superior Coronary, Laterallis nasi, and Angular.

Branches of the Occipital artery are Muscular, Sterno-Mastoid, Inferior Meningeal, Auricular, Arteria Princeps Cervices.

Branches Posterior Auricular.—Stylo-Mastoid and Auricular.

Branches Internal Maxillary are, Tympanic, Middle Meningeal, Small Meningeal,

Inferior Dental, Deep Temporal, Pterygoid, Maseter, Bucal, Alveolar, Infera Orbital, Posterior or descending Palatine, Vidian, Pterygo-Palatine, Naso or Spheno-Palatine.

Branches Internal Carotid Artery are Tympanic, Arteria Receptaculi, Anterior Meningeal, Opthalmic, Anterior Cerebrel, Middle Cerebral, Posterior Communicating, and Anterior Choroid.

Branches of Vertebral Artery are Lateral Spinal, Muscular, Posterior Meningeal, Anterior Spinal, Posterior Spinal and Inferior Cerebellar.

Branches of the Opthalmic Artery are Lachrymal, Supra Orbital, Posterior Ethmoidal, Anterior Ethmoidal, Palpebral, Frontal, Nasal, Muscular, Anterior Ciliary, Short Ciliary, Long Ciliary, and Arteria Centralis Retinae.

Branches of the Basilar are Transverse, Anterior Cerebellar, Superior Cerebellar, and Posterior Cerebellar.

Branches of the Inferior Thyroid Artery are Laryngeal, Tracheal, Oesophageal and Ascending Cervical.

Branches of Internal Mammary Artery are Comes Nervi Phrenici, Mediastinal, Pericardiac, Sternal, Anterior Intercostal, Perforating, Musculo-Phrenic, and Superior Epigastric.

Branches of the Axillary Artery are Superior Thoracic, Accromial Thoracic, Thoracica Longus, Thoracica Alaris, Sub-Scapular, Anterior Circumflex and Posterior Circumflex.

Branches of the Brachial Artery are

Superior Profunda, Nutrient Artery, Inferior Profunda, Anastomotica Magna and Muscular.

Branches of the Radial Artery are Radial Recurrent, Muscular, Superficialis Volae, Anterior Carpal, Posterior Carpal, Metacarpal, Dorsalis Pollicis, Dorsalis Indicis, Princeps Pollicis, Radialis Indicis, Perforating and Interosseae.

Branches of the Ulna Artery are Posterior Ulnar Recurrent, Anterior Ulnar Recurrent, Anterior Interosseous, Posterior Interosseous, Muscular, Anterior Carpal, Posterior Carpal, Deep or Communicating Branch, and Digital.

Branches of the Thoracic Aorta.—Pericardiac, Bronchial, Oesophageal, Posterior Mediastinal, and Inter-Costal.

Branches of the Abdominal Aorta are Phrenic, Hepatic, Gastric, Splenic, Superior Mesenteric, Supra Renal, Renal, Spermatic, Inferior Mesenteric, Lumbar and Sacra Media.

Branches of Hepatic Artery are Pyloric, Gastro-Duodenalis and Cystic.

Branches of the Gastro-Duodenalis are Gastro-Epiploica Dextra and Pancreatico-Duodenalis.

Branches of the Splenic artery are Pancreaticæ Parva, Pancreatica Magna, Gastric (Vasa Brevia), Gastro-Epiploica Sinistra.

Branches of the Superior Mesenteric artery are Inferior Pancreatico-Duodenal, Vasa Intestini Tenuis, Ilio-Colic, Colica Dextra, and Colica Media.

Branches of the Inferior Mesenteric artery are Colica Sinistra, Sigmoid, and Superior Hæmorrhoidal.

Branches of the Internal Iliac artery are Superior Vesical, Middle Vesical, Inferior Vesicle, Middle Hemorrhoidal, Uterine, Vaginal, Obturator, Internal Pudic, Sciatic, Gluteal, Ilio-Lumbar, Lateral Sacral.

Branches of the Internal Pudic artery are Inferior or External Hemorrhoidal, Superficial Peroneal, Transverse Peroneal, Artery of the Bulb, Artery of the Corpus Cavernosum, and Dorsal artery of the penis.

Branches of the Femoral artery are Superficial Epigastric, Superficial Circumflex Iliac, Superficial External Pudic, Deep External Pudic, External Circumflex, Internal Circumflex, Three Perforating, Muscular, and Anastomatica Magna.

Branches of the Popliteal artery are Superior Muscular, Inferior Muscular or Sural, Cutaneous, Superior External Articular, Superior Internal Articular, Azygov Articular, Inferior External Articular, and Inferior Internal Articular.

Branches of the Anterior Tibial artery are Recurrent Tibial, Muscular, Internal Malleolar and External Malleolar.

Branches of the Posterior Tibial artery are Peroneal, Muscular, Nutritient, Communicating, and Internal Calcanian.

Triangles of the Neck.—The Anterior Triangular space has its base upward, and formed by the lower part of the body of the Inferior Maxillary bone, its apex reaching down to the Sternum. Its sides are formed anteriorly by a line extending from the chin to the Sternum, posteriorly by the

anterior margin of the Sterno-Mastoides. The anterior triangle is divided into three smaller triangles by the digastric muscle above, and the anterior belly of the Hyoid muscle below. These are named from below upward, the Inferior Carotid triangle, Superior Carotid triangle, and the Sub-Maxillary triangle. The first named is limited in front by the median line of the neck, behind by the anterior margin of the Sterno-Mastoid, above by the anterior belly of the Omo-Hyoid.

The Superior Carotid triangle is bounded behind by the Sterno-Mastoid, above by the anterior belly of the Digastric, below by the anterior belly of the Omo-Hyoid, the Sterno-Mastoid forming its base, which is situated posteriorly.

The Sub-Maxillary triangle is situated with its base upward, formed by the body of the Inferior Maxillary, the Parotid gland and the Mastoid process, behind by the posterior belly of the Digastric, and Stylo-Hyoid muscles, in front by the middle line of the neck.

The posterior triangular space of the neck is bounded in front by the Sterno-Mastoid muscle, behind by the anterior part of the Trapezius, its base the upper part of the Clavicle, its apex reaching the Occipit. This triangle is divided into two triangular spaces by the crossing of the Omo-Hyoid an inch above the Clavicle, the upper one being called the Occipital, the lower one the Sub-Clavian. The former is bounded in front by the Sterno-Mastoid, behind by the Trapezius, and below

by the Omo-Hyoid. The latter is bounded above by the posterior belly of the Omo-Hyoid, below by the Clavicle, in front by the Sterno-Mastoid, which limits its base.

The Circle of Willis is one of the most remarkable examples of anastomosis, and is formed by the branches of the Vertebral and Internal Carotid arteries at the base of the brain. In front it is formed by the Anterior Cerebral and the Anterior Communicating, on each side by the trunk of the Internal Carotid and the Posterior Communicating, behind by the Posterior Cerebral arteries and part of the Basilar. By this anastomosis the cerebral circulation is equalized and complete arrangement perfected to carry it on should one or more of the arteries be obliterated.

The Thyroid Axis is a short, thick trunk which arises from the forepart of the first portion of the Sub-Clavian artery, and divides into three branches almost immediately—the Inferior Thyroid, Sub-Scapular and Transversalis Colli.

The Axilla is a conical space at the upper and lateral part of the chest and inner side of the arm. Its apex is directed upward toward the root of the neck, the base directed downward is formed by the integument and a thick layer of fascia. It is bounded anteriorly by the Pectoralis Major and Pectoralis Minor muscles, its posterior boundary is formed by the Subscapularis, Teres Major, and Latissimus dorsi, on the outer side, where the anterior and posterior boundaries converge the space is narrow and bounded by the Humerus,

Coraco-Brachialis and Biceps muscles. In this space are found the Axillary vessels, the Brachial plexus of nerves with their branches, some of the Intercostal nerves, and a large number of Lymphatic glands, all connected together by a loose quantity of fat and Areolar tissue.

The Plantar Arch of the Foot, similar to the Palmar arch, distributes numerous vessels, to the muscles, integument and fascia of the sole and gives off two branches, the Posterior Perforating, and the Digital or Anteiror Perforating.

Phlebology.—(The Anatomy of the Veins.)—The Veins are cylindrical tubes which convey the dark or venous blood from the various organs back to the heart. They do not remain open after death or after being emptied, but collapse immediately. The veins anastomose freely, and form innumerable inosculations with the capilaries, the smaller ones uniting to form larger trunks which increase in size as they approach the heart by the frequent addition of other trunks. They are found in nearly every part of the body and are called the Systemic set of veins, those of the lungs are called the Pulmonary system of veins. Veins are divided into three sets, the superficial, deep and the sinuses. The superficial or cutaneous veins are found between the layers of superficial fascia, immediately beneath the integument, they return the blood from these parts, and communicate with the deep veins by perforating the deep fascia. The Deep Veins accompany the arteries. The

smaller examples of arteries have two accompanying veins, as the Radial, Peroneal, etc., these veins are the Venae Comites. Exceptions to the rule are found in the veins of the skull and spinal canal, Hepatic veins in the liver, and the larger veins returning the blood from the osseous tissue. Sinuses are venous channels which differ from veins in their mode of distribution, and their structure. In the interior of the skull they are formed by a subdivision of the dura mater, their outer coat consisting of fibrous tissue, the inner coat of serous membrane, continuous with the serous membrane of the veins. Veins are formed of three coats, named from their position, External, Middle and Internal.

The Internal coat is similar in structure to that of the arteries. In the veins of the gravid uterus, and in the long Saphenous and Popleiteal veins, muscular tissue is one of the component parts.

The Middle coat is thin, and contains a smaller amount of elastic and muscular tissue, but more connective tissue than the middle coat of the arteries.

The External coat is usually the thickest, increasing in thickness with the size of the vessel. In structure it is similar to the external coat of the arteries. In some veins it contains a longitudinal network of muscular fibres. In the smallest veins it consists of a thick layer of nucleated, connective tissue, in veins of a medium size it is much thicker than the middle coat, and consists of elastic and connective tissue, the fibres of which are

longitudinally arranged. In the largest vessels this coat is from two to five times thicker than the middle coat. All the large veins entering the heart are covered a short distance by a layer of muscular tissue continued on them from the heart. Muscular tissue is absent in the veins of the Maternal part of the Placenta, in most of the Cerebral veins and sinuses of the Dura Mater, in the veins of the Retina, in the veins of the Cancellous tissue of bone, in the venous spaces of the Corpora Cavernosa. Most veins are provided with Valves, which prevent the reflex of blood and are formed by the reduplication of the middle and inner coats, and consists of connective tissue and elastic fibres, covered on both sides by epithelium. Form of the valve is semi-lunar, two such valves are usually found opposite each other, especially in the smaller veins, or in the larger trunks where they are joined by a smaller branch. Sometimes there are three, sometimes only one valve. They are the most numerous in the lower extremities where the blood is forced upward against the force of gravity, and are absent in the very small veins, and in the Portal, Ovarian, Venæ Cava, Uterine and Hepatic veins. In the Azygos and Intercostal veins they are found in small numbers. Nerves are seldom found distributed to veins. They receive their blood supply by the Vassa Vassorum.

Veins of the exterior of the head are the Fascial, Temporal, Internal Maxillary, Temporo-Maxillary, Posterior Auricular and the Occipital.

Veins of the Neck are External Jugular, Posterior External Jugular, Anterior Jugular, Internal Jugular and Vertebral.

The Cerebral Veins are remarkable for the thinness of their walls, for the absence of valves, and the absence of muscular tissue in their coats.

The Superior Cerebral veins, seven or eight in number on each side, pass forward and inward toward the great longitudinal fissure, where they receive the Internal Cerebral veins.

The Inferior Anterior Cerebral veins commence on the under surface of the anterior lobes of the brain, and terminate in the Cavernous sinuses.

The Inferior Lateral Cerebral veins commence on the latteral parts of the hemispheres and at the base of the brain. They unite to form from three to five veins which open into the lateral sinuses from before backward.

The Inferior Median Cerebral veins, which are very large, commence at the forepart of the under surface of the Cerebrum, and from the convolusions of the posterior lobe, and terminate in the straight sinus behind the Venæ Galeni.

The Deep Cerebral, or Ventricular veins (Venæa Galeni) are two in number, one from right and one from the left ventricle. They pass out of the brain at the great transverse fissure. The Vena Corpis Striati begins in the groove between the Corpus Striatum and the Thalamus Opticus. By uniting with the Choroid veins it forms one of Venæ Galeni.

The Choroid Vein runs along the entire length of the outer border of the Choroid plexus, receiving veins from the Hippocampus Major, the Fornix and Corpus Callosum and unites at the anterior border of the Choroid plexus with the vein of the Corpus Straitum.

The Cerebellar Veins occupy the surface of the Cerebellum and are disposed in three sets—Superior, Inferior and Latteral.

The Sinuses of the Dura Mater are venous channels, analagous to the veins, their outer coat is formed by the Dura Mater, their inner by a continuation of the serous membrane of the veins; they are fifteen in number. The sinuses at the upper and back part of the skull are Superior Longitudinal, Inferior Longitudinal, Straight Sinus, Latteral Sinuses and Occipital. Those at the base of the skull are the Cavernous, Circular, Inferior Petrosal, Superior Petrosal, and Transverse.

Veins of the Diplœ (channels in the skull for the passage of veins) are large, with thin walls formed only of epithelium, resting upon a layer of elastic tissue. At irregular intervals they present pouch-like dilitations which serve as reservoirs for the blood. They can only be revealed by removing the outer tablet of the skull. They increase in size and communicate with one another in adult life. They communicate with the Meningeal veins in the interior of the cranium, and the sinuses of the Dura Mater, on the exterior of the skull with the veins of the Pericranium. They are divided into the frontal, Anterior Temporal, Posterior Temporal and Occipital.

Superficial veins of the upper extremity are the superficial veins of the hands, Anterior Ulnar, Posterior Ulnar, Basilic, Radial, Cephalic, Median, Median Basilic, Median Cephalic.

The Axillary Vein is of large size and formed by the continuation upward of the Basilic vein. The Subclavian vein is the continuation of the Axillary.

The Venæ Innominatæ are two large trunks placed one on each side at the root of the neck and formed by the union of the Internal Jugular and Subclavian veins.

The Right Venæ Innominata is an inch and a half long, commencing at the inner end of the clavicle, and passing downward joins the left Vena Innominata to form the Superior Vena Cava.

The Left Vena Innominata is about three inches in length and larger than the right, unites with its fellow to form the Superior Vena Cava.

The Internal Mammary Veins, two in number to each artery, receive branches corresponding with the branches of that vessel. Each pair unite in one trunk to open into the Innominate vein.

The Thyroid veins originate from the Thyroid plexus of veins that lie on the Thyroid body. They communicate with the Middle and Superior Thyroid veins. They vary in number from two to four and terminate in the Innominate vein.

The Superior Intercostal veins return the

blood from the upper Intercostal spaces. They terminate in the Innominate vein.

The Superior Vena Cava receive the venous blood from the entire upper part of the body. It enters the pericardum about an inch and a half above the heart, and terminates in the upper part of the right auricle.

The Azygoz veins connect together the Superior and Inferior Vena Cava. The right Azygoz is the larger and receives nine or ten lower Intercostal veins on the right side, the Azygoz Minor, several Œsophageal, Mediastinal, Vertebral and right Broncial vein, sometimes the right Superior Intercostal vein.

The left, lower or smaller Azygoz vein commences in the lumbar region by a branch from one of the lumbar or the left Renal veins.

The Bronchial veins return the blood from the substance of the lungs.

The Spinal veins are divided into four sets.

The Dorsi Spinal veins, those placed on the exterior of the spinal column, the Meningo-Rachidian veins, those situated in the interior of the spinal canal, between the vertebræ and the Theca Vertebralis; the Venæ Basis Vertebrarum, (the veins of the bodies of the Vertebræ,) and the Medulli-Spinal veins, (veins of the spinal cord.)

Superficial veins of the lower extremity are the Internal or Long Saphenous, and the External or Short Saphenous. The former originates from the Plexus of the foot on the dorsum and inner side and ascends on the inner side of the leg and terminates in the

Femoral vein an inch and a half below Poupart's ligament. It receives numerous branches in its ascent. The latter is formed by branches which collect the blood from the dorsum and outer side of the foot. It passes upward on the outside of the leg, but occupies the posterior part of the thigh and terminates in the Popliteal vein between the heads of the Gastrocnemius muscle. It is accompanied by the External Saphenous nerve. Smaller veins accompanying the large ones are called their Venæ Comites.

The Anterior and Posterior Tibial veins are the deep veins of the leg, and their Vena Comites uniting form the Popliteal vein.

The External Iliac vein commences at the termination of the Femoral, passing along the brim of the Pelvis it unites with the Internal Iliac to form the Common Iliac vein, opposite the Sacro-Iliac Symphysis. It has no valves.

The Internal Iliac vein is formed by the Venæ Comites of the Internal Iliac artery, the Umbilical arteries excepted. It receives the blood from the exterior of the pelvis, and the organs in its cavity from the Hemorrhoidal, Vesico-Prostatic, Dorsal vein of the penis, Vaginal and Uterine Plexus.

The Inferior Vena Cava returns the blood from the entire body below the diaphragm. It is formed by the joining of the two common Iliac veins. It terminates in the lower and back part of the right auricle. The Eustachian valve is situated at this point. It receives in its course the Lumbar, Right Sper-

matic, Renal, Supra Renal, Phrenic and Hepatic veins.

The Portal system of veins are the Inferior and Superior Mesenteric, the Splenic and Gastric veins. They return the blood from the viscra of digestion, and form the Venæ Porta, which enters the liver at the transverse fissure.

The Cardiac veins return the blood from the substance of the heart and are the Anterior and Posterior Cardiac, Left Cardiac, right or small Coronary Sinus, Right Cardiac, Left or great Coronary Sinus and Venæ Thebesii.

The Pulmonary veins are two in number on each side. They return the blood from the lungs and *carry Arterial blood*, are destitute of valves; they are a little larger than the arteries they accompany; they accompany these vessels singly; they open into the left auricle, generally separately.

Lymphatics are glands which include the Lacteal or Chyliferous glands, and are called also absorbent and conglobate glands.

The Lacteals are so-called on account of the fluid they contain showing through their walls, giving them a white appearance. This they obtain from the small intestine during digestion and convey it through the Thoracic duct into the blood. Lymphatics are exceedingly delicate. Their usual size is interrupted by valves of a semilunar form, which give to them a beaded appearance. They are found in nearly every part of the body excepting the substance of the brain, spinal cord, eye ball, cartilages, tendons, membranes of the ovum,

Placenta, Umbilical cord, nails, cuticle and hair. They are divided into a superficial and deep set, the former lying immediately beneath the skin accompanying the superficial veins and sometimes join the deep lymphatics by perforating the deep fascia. The deep lymphatics lie in the submucus areolar tissue and beneath the serous membrane covering the various organs in the cranium, thorax and abdomen. They are more numerous, more delicate, and anastomose more frequently than the veins. They are composed of three coats, external, middle and internal, and have no nerves.

The Conglobate glands are small, solid glandular bodies found in the course of the lymphatic and lacteal vessels, are prominent in the neck, head, axilla, in front of the elbow, groin and popliteal space. They are pinkish grey, and from a hemp seed to an almond in size, and are round or oval.

The Thoracic duct is the common trunk of all the lymphatics except those of the right side of the head, thorax, neck, right arm, right lung, right side of the heart, and the convex surface of the liver. It is from eighteen to twenty inches long, and opens near the junction of the left Internal Jugular and the Sub-Clavian vein. At the bottom is a dilatation called the Receptaculum Chyli. The Right Lymphatic duct terminates in the Right Sub-Clavian vein and drains the lymphatics not connected with the Thoracic duct.

Neurography.—The nervous system consists of a series of connected central organs

called collectively the Cerebro-Spinal centre or axis of the Ganglia and of the nerves. The first includes the brain and spinal cord, and are called the nerves of animal life. The second or sympathetic system is a double chain of ganglia called the nerves of organic life. This system is not intimately connected with the mind, as the first named, but presides over the involuntary action of organs mainly.

Microscopically, nerves are composed of two kinds of nerve fibres—Tubular and Gelatinous. The former being most abundant in the Cerebro-Spinial system, the latter predominating in the sympathetic system. The center of a nerve consists of a transparent substance which is the essential part of a nerve proper, it is surrounded by a white, dimly granular substance called the white substance of Schwann, which acts as a protective insulator. Nerve fibres in the brain and spinal cord measure from 1-10,000 to 1-14,000 of an inch, those of the trunk and branches of the nerves are from 1-2000 to 1-3000. The vesicular nervous substance is distinguished by its dark reddish, gray color, and its softness. It is found in the brain, spinal cord, and various ganglia intermingled with fibrous nervous substance, but is never found in the nerves. The Ganglia may be regarded as separate and independent nervous centers. They are found on the posterior root of each of the spinal nerves, on the posterior or sensory root of the fifth cranial nerve, on the facial nerve, on the Glosso-Pharyngeal and Pneumogastric nerves, in a connected series along each side

of the vertebral column, forming the trunk of the sympathetic, on the branches of that nerve in the head, neck, thorax and abdomen. They are reddish gray, and all essentially similar in structure. Nerves divide and subdivide innumerably and permeate nearly every part of the body; their fibres do not coalesce, but each individual fibre may be traced to its root. The origin of all nerves is the brain or spinal cord. The termination of nerves occur in loops, brush-shaped expansions, plexuses, and by free ends.

The Spinal Cord or Medullo-Spinalis is the cylindrical, elongated part of the Cerebro-Spinal axis which is contained in the spinal canal. Its weight is 1-33 that of the brain, its length about 16 inches. It terminates in the filum terminale at the lower border of the fifth Lumbar vertebræ. The spinal cord is a great dynamo of force, from whence spring nerves of motion and sensation. It is of flattened cylindrical form. It has an anterior and posterior fissure which divides it in halves, and the cord is described as the anterior and posterior columns from their position, which are connected together throughout its entire length by a commissure of nervous substance. On each side of the Anterior Median fissure numerous small foramina may be observed, showing the point from which the anterior roots of the spinal nerves emerge. These linear foramen have been described as the Anterior lateral fissure. The Posterior lateral fissure of the cord is very delicate. The cord is divided into four columns by its fissures,

and is so described. The cord is composed of a white and gray substance. The former, located externally, constitutes the larger part of the cord; the latter occupies its center. The cord is enveloped by a layer of three membranes—the Dura Mater, Arachnoid and Pia Mater, named from the outside inward.

The membranes surrounding the brain are the same in number and name as those surrounding the spinal cord.

The brain or encephalon is that part of the Cerebro-Spinal axis that is contained within the cranium. It is divided into four parts, the Cerebrum, Cerebellum, Pons Varolii, and Medulla-Oblongata. The first named forms the greater portion of the encephalic mass. The Crus Cerebri from its base is directed downward into the Pons Varolii, and through it to the Medulla Oblongata and spinal cord, another portion the Crus Cerebelli passes down into the Cerebellum.

The Cerebellum is situated in the Inferior Occipital Fossa and is connected to the rest of the brain by connecting bands called Crura, two ascending to the Cerebrum, two descend to the Medulla Oblongata, two blend together in front forming the Pons Varoli. The latter rests upon the upper part of the Basilar process, and constitutes the bond of union for the four divisions of the brain.

The Medulla Oblongata rests in the Basilar groove of the Occipital bone, and extends from the lower part of the Pons Varoli to the upper part of the spinal cord. Average male brain weighs 49½ ounces; the female 44

ounces. It grows rapidly up to the seventh year; less so until fully developed. Then it declines about an ounce every ten years after the thirtieth or fortieth year. The Human brain is heavier than that of any other animal except the whale and elephant. Objects of interest at the base of the brain are the Longitudinal fissure, Corpus Callosum and its Peduncles, Lamina Cinerea, Olfactory nerve, Fissure of Sylvius, Anterior perforated space, Optic Comissure, Tuber Cinereum, Infundibibulum, Pituitary body, Corpora Albicantia, Posterior perforated space and the Crura Cerebri. The Longitudinal fissure passing anterio posteriorly, it partially divides the brain into two separate hemispheres—the right and the left. The Fissure of Sylvius separates the anterior and middle lobes and lodges the middle Cerebral artery. It conceals the Island of Reil. From this point language is supposed to originate. The Optic Commissure is situated in the middle line behind the Lamina Cinerea. The Cerebrum on examination is found to be composed of white matter, the Centrum Ovale Minus, a layer of gray substance surrounding its circumference, on every part the same thickness of the layer being preserved.

The Ventricles of the brain are cavities within its substance, five in number. The Lateral Ventricles are serous cavities formed by the upper part of the general ventricular space in the interior of the brain. The third Ventricle is a narrow, oblong fissure placed between the Thalami Optici and extending to

the base of the brain. It is crossed by three commissures—the Anterior, Middle and Posterior, and has four openings.

The Pineal Gland is a small, reddish gray, cone-shaped body, placed behind the posterior commissure, between the nates.

The Optic Lobes or Tubercula Quadrigemina, are connected with the optic nerves, are four in number—two pairs—and are situated immediately behind the third Ventricle and Posterior commissure. The white matter of each hemisphere consists of three kinds of fibres, diverging or peduncular, which connect the hemispheres with the cord and Medulla Oblongata. The transverse or commissureal fibres, which connect the two hemispheres together, and the Longitudinal Commissural fibres which connect distant parts of the same hemisphere together.

The Cerebellum, in the average male weighs 4½ ounces—heaviest from thirtieth to fortieth year, smaller in infancy than adult age, oblong, flattened from above downward, measuring from 3½ to 4 inches transversely, and from 2 to 2½ inches from before backward. It is traversed by numerous curved, nearly parallel sulci. On the upper surface of each hemisphere are two lobes, the anterior or square, and the posterior or semi-lunar. The under surface has five lobes, the Flocculus or Sub-Peduncular, Pneumogastric, Amygdalia or Tonsil, Digastric, and the Inferior Posterior Lobe.

The Fourth Ventricle, or ventricle of the Cerebellum, is the space between the Medulla

Oblongata and Pons in front, and the Cerebellum behind. It is lozenge-shaped, its floor the Oblongata and Pons, its cavity communicates below with the Sub-Arachnoid space of the brain and cord through an aperture in the Pia Mater. It opens into the third Ventricle through the acqueduct of Sylvius. The Choroid plexus of the fourth Ventricle are two in number.

Cranial Nerves, nine on each side, described as pairs, arise from the Cerebro-Spinal center and find exit from the cranium through the foramina at its base. Their names are appropriately chosen, descriptive of their distribution or function, named in their order from before backward as they pass through the Dura Mater, lining the base of the skull. They are (1) Olfactory, (2) Optic, (3) Motor Oculi, (4) Pathetic, (5) Trifacial or Trigemini, (6) Abducens, (7) Facial or Portio Dura and the Auditory or Portio Mollis, (8) Glosso-Pharayngeal, Pneumogastric or Par Vagum and Spinal Accessory, (9) Hypoglossal.

The first, or Olfactory, is the special nerve of the sense of smell; has its origin by three roots. The external or long has its deep origin in the Corpus Striatum, Optic Thalamus, Anterior Commissure and the Island of Reil, the middle or gray root from the Coruncula Mammalaris, and the Corpus Striatum, the internal or short root from the Gyrus Fornicatus. The three roots unite and form the Olfactory bulb from whence some

twenty filaments are distributed to the mucus membrane of the nose.

Optic Nerve, second pair, the special nerve of sight, is distributed exclusively to the eyeball. The two nerves are connected at the Commissure and continue from it back into the brain under the name of the optic tracts, which are continued into the Optic Thalami, Corpora Geuticulata, and the Corpora Quadrigemina. They receive fibres from the Tuber Cinereum and Laminia Cinerea. The Optic Nèrve on entering the posterior part of the globe of the eye expands into the retina.

The Auditory Nerve, the Portio Mollis of the seventh pair, is the special nerve of the sense of hearing, and is exclusively distributed to the internal ear. The Auditory Nerve arises from the linia transversæ from the floor of the fourth ventricle. The gray matter of the Medulla, the Flocculus, gray matter of the Calamus Scriptorius, receives fibres from the restiform body. The nerve enters the meatus (with the fascial nerve), dividing into two branches Cochlear and Vestibular, the former to the Cochlea, the latter to the Semicircular canals.

Third, or Motor Oculi Nerve, as its name implies, supplies all the muscles of the eyeball, except the Superiør Oblique and Rectus Externus. It sends motor filaments to the iris. It arises from the substance of the Crura Cerebri, Locus Nigar, Tuburcula Quadrigemina, Valve of Vieussens, a gray nucleus in the floor of the aqueduct of Sylvius; receives two filaments from the Sympathetic.

Fourth, or Trochlear Nerve, smallest of the cranial nerves, supplies the Superior Oblique. It arises from the valve of Vieussens, divides one root arising from a gray nucleus in the floor of the Aqueduct of Sylvius, the posterior one from a gray nucleus in the floor of the fourth ventricle close to the origin of the fifth.

Abducens, or sixth, supplies the Rectus Externus. It arises from the floor of the fourth ventricle from a gray nucleus, and from the Corpus Pyramidale.

The Fascial Nerve, the Portio Dura of the seventh pair, is the motor nerve of all the muscles of the face—the Platysma and Buccinator—also the muscles of the external ear, the posterior belly of the Digastric and Stylo-Hyoid. By its branches it supplies the Lingualis, Stapedius, Laxator Tympana, Tensor Tympani, Levator Palati and Azygos Uvulæ. It arises from the lateral tract of the Medulla Oblongata, and a gray nucleus on the floor of the fourth ventricle. The Portio Internum Duram et Mollum of Wrisburg, is its accessory and has its origin from the lateral columns of the cord. Near the Hiatus Fallopii it forms the Intumescentia Gangliformis, and is here joined by several nerves. From here it suddenly turns and finds exit through the Stylo-Mastoid Foramen. It divides into the Temporo-Facial, and the Cervico-Facial, from which numerous branches are given off which are distributed over the side of the head, face, upper part of the neck, supplying these muscles. It communicates with two

Ganglia of nerves, and the Sympathetic. It gives off the following branches: Tympanic, Chorda Tympani, Posterior Auricular, Digastric, Stylo-Hyoid, Temporal, Malar, Infra-Orbital, Buccal, Supra-Maxillary, and the Infra-Maxillary.

Hypoglossal Nerve, or ninth, is the motor nerve of the tongue. It arises by ten or fifteen filaments from the groove between the Olivary and Pyramidal bodies in a continuous line with the Anterior Spinal nerves, and a gray nucleus in the floor of the Medulla Oblongata. Its branches communicate with the Pneumogastric, Sympathetic, first and second Cervical Nerves and Gustatory.

Trifacial or Trigeminus, the fifth pair, is the largest cranial nerve, resembles a spinal nerve in its origin by two roots (an anterior or motor), and the existence of a Ganglia on its posterior or sensory roots. It is a nerve of motion to the muscles of mastication, sensation to the head and face; and of special sense of taste to the tongue.

The Opthalmic is the first division of the fifth. It gives off the Lachrymal, Frontal and Nasal. These are distributed as their name implies.

The Superior Maxillary, the second divisision of the fifth, is a sensory nerve. It commences at the Casserian Ganglion and passes forward through the Foramen Rotunda. It appears on the face at the Infraorbital Foramen. Its branches are the Orbital, Spheno-Palatine, Posterior Dental, Anterior Dental, Palpebral, Nasal and Labial.

The Inferior Maxillary, the third division of the fifth nerve, the sensory root proceeding from the inferior angle of the Casserian Ganglion, the motor root passing beneath the Ganglion joins the Inferior Maxillary after its exit through the Foramen Ovale, supplies branches to the teeth, gums of the lower jaw, integument of the temple and external ear, lower part of face, the under lip, muscles of mastication, and the tongue with a nerve of special sense. Its anterior division gives off the Masseteric, Deep Temporal, Buccal and Pterygoid. The Auriculo-Temporal nerve arises from two roots. It has branches of communication with the Facial and Otic Ganglion.

Gustatory, or Lingual, one of the nerves of special sense of taste, supplies the Papilla and mucous membrane of the tongue. Its communicating brances are with the Sub-Maxillary Ganglion and Hypoglossal Nerve. Its branches supply the mucous membrane of the mouth, gums, Sub-Lingual Gland, the Conical and Fungiform Papilla and mucous membrance of the tongue. The terminal filaments Anastamose with branches of the Hypoglossal at the end of the tongue. Connected with the three divisions of the fifth nerve are four small Ganglia which form the whole of the Cephalic portion of the Sympathetic. With the first division is connected the Opthalmic Ganglion, with the second division the Spheno-Palatine or Meckels Ganglion, with the third the Otic and Sub-Maxillary Ganglion. They receive sensitive filaments

from the fifth, and motor and sensitive filaments from various sources. The filaments are called roots of the Ganglia. The Glosso-Pharyngeal nerve is distributed to the tongue and pharynx, is the nerve of sensation to the mucus membrane of the pharynx, tonsils and fauces; of motion to the pharyngeal muscles, and a special nerve of taste to all the parts of the tongue which it supplies. It passes through the Jugular Foramen and forms the Jugular and the Petrous Ganglia.. The latter gives the branches which unite the Glosso-Pharyngeal with other nerves at the base of the cranium.

The Pneumogastric, or Parvagum, one of the three divisions of the eighth pair, has the most extensive distribution of any of the cranial nerves, passing through the neck and chest of the upper part of the abdomen, and is both motor and sensitive. It supplies the organs of voice and respiration with motor and sensitive fibres, the Pharynx, oesophagus, stomach and heart with motor influence. Its deep origin is from a gray nucleus near the lower part of the floor of the fourth ventricle. It finds exit from the skull through the Jugular Foramen, and presents immediately a Ganglionic enlargement—the Ganglion Jugular. Below it is its Ganglion Inferioris. This nerve is contained in the sheath with the Carotid vessels in the neck. Branches of the Pneumogastric are Auricular, Pharyngeal, Superior Laryngeal, Recurrent Laryngeal, Cervical Cardiac, Thoracic Cardiac, Anterior and Posterior Pulmonary, Œsophageal and

Gastric. The names are suggestive of their distribution.

The Spinal Accessory of the eighth pair is of two parts, one the accessory part to the Vagus, the other the spineal portion. The former arises from a nucleus of gray matter at the back of the Medulla, below the origin of Vagus, the latter from the lateral tract of the cord as low down as the sixth Cervical nerve and is connected with the anterior horn of the gray crescent of the cord. It enters the skull through the Foramen Magnum, and passes out of the Jugular Foramen.

The Spinal Nerves, arising from the spinal cord, find exit through the Inter-Vertebral Foramen on either side. Given the same name as the spinal region through which they pass, they are in pairs—Cervical, eight; Dorsal, twelve; Lumbar, five; Sacral, five; Coccygeal, one. Each nerve arises by a posterior or sensitive root, and an anterior or motor root. The former are attached to the posterior white columns, but some pass through the lateral and anterior white columns. Within the gray substance the fibres run longitudinally, transversely through the posterior commissure to the opposite side, and into the anterior column of their own side. The posterior roots are larger than the anterior, but their individual filaments are smallest. The latter are the smaller, devoid of Ganglion, have origin from the anterior part of the cord. The anterior branches supply the body in front of the spinal column including the limbs, and are larger in size than

those of the posterior nerves, each being connected to the Sympathetic.

The Cervical Nerves.—The posterior root is three times as large as the anterior. They increase in size from the first to the fifth, then remain the same to the eighth. Each nerve at its exit divides into an anterior and posterior branch. The anterior branches of the four upper Cervical form the Cervical Plexus; those of the four lower ones with the first Dorsal form the Brachial Plexus. The Cervical Plexus is situated in front of the four upper Cervical Vertebræ, its branches are the Superficialis Colli, Auricularis Magnus, Occipitalis Minor, Supra-Clavicular, Communicating, Muscular, Communicans noni, Phrenic, (Bell's respiratory nerve, distributed to lower surface of diaphragm,) Communicating and muscular. The Brachial Plexus extends from the lower border of the side of the neck to the Axilla, divides opposite the Coracoid process into numerous branches to supply the upper limb. The fifth and sixth unite near their exit, the seventh joining this trunk, these three forming one trunk. The eighth and the first Dorsal unite into one trunk. Each of these two cords give off a Fasiculus (opposite the Clavicle) which uniting form a third trunk, one lying on the outer, inner, and under side of Axillary artery. The Brachial, Cervical, and Phrenic Plexuses Communicate. Branches of the Brachial Plexus above the Clavicle, are the Communicating, Muscular, Posterior Thoracic and Suprascapular. Below the Clavicle they are the Anterior Thor-

acic, Subscapular, Circumflex, Musculo-Cutaneous, Internal Cutaneous, Lesser Internal Cutaneous, Median, Ulnar and Musculo-Spiral.

Branches of the Ulnar Nerve are the Articular (elbow), Muscular, Cutaneous, Dorsal and Articular (wrist). In the hand it gives off the Superficial and deep Palmer.

The Dorsal nerves—twelve on each side. Their roots are small and about the same size from the second to last. The roots remain in the spinal cord, the distance of two Vertebræ. Their external branches supply the Longissimus Dorsi, Sacro-Lumbalis and the Levatores Costarum. The six upper internal are distributed to the Multifidious Spinae and Semi-Spinalis Dorsi, then become cutaneous. Their cutaneous branches are twelve in number.

The Intercostal Nerves.—The Anterior branches of the second, third, fourth, fifth and sixth Dorsal are distributed to the Parietes of the thorax and abdomen and form no plexus. Each nerve is connected with the sympathetic. The posterior branches supply the integument over the Scapula and Latissamus Dorsi.

Lumbar Nerves are five in number on each side, have the largest roots and the most filaments of the spinal nerves. Their external branches supply the Erector Spinæ and Inter-Transverse muscles. Cutaneous branches from the three upper nerves supply the Sacro-Lumbalis and Latissimal Dorsi and muscles in the Gluteal region. The internal branches supply the Multifidus Spinæ and Inter-

Spinales. The Lumbar Plexus is formed by the loops of communication between the anterior branches of the four upper nerves. Its branches are the Ilio-Hypogastric, Ilio-Inguinal, Genito-Crural. These branches may be divided into two sets, one of which supplies the lower part of the parietes of the abdomen, the other group supplying the inner side of the leg and forepart of the thigh.

The External Cutaneous nerve arises from second or third Lumbar. It divides into two branches, Anterior and Posterior, the former supplies the integument of the anterior and outer side of the thigh to the knee, the latter supplying the integument of the outer and posterior part of the thigh as far down as the knee. The Obturator supplies the knee and hip joints, its branches supplying several muscles of the thigh. The Accessory Obturator and its branches supply several muscles of the thigh and leg and the hip joint. The Anterior Crural nerve, the largest branch of the Lumbar Plexus supplies all the muscles of the Anterior Femoral region except the Tensor Vaginæ Femoris. It supplies the inner side of the leg and foot, the Iliacus and Pectineus. External to the Pelvis it gives off the Middle and Internal Cutaneous, Long Saphenous, Muscular and Articular. These branches supply the thigh, leg and foot. The Sacral Plexus is formed by the Lumbo-Sacral, the Anterior branches of the upper and part of the fourth Sacral nerves. Its branches are the Muscular, Superior Gluteal, Pudic, Small Sciatic and Great Sciatic. The

latter supplies nearly the whole of the integument of the leg, muscles in the back of the thigh and of the leg and foot. It is the largest nervous cord in the body, is the continuation of the lower part of the Sacral Plexus, and is three-quarters of an inch in diameter. It finds exit through the great Sacro-Sciatic Foramen.

The Sympathetic Nerve consists of a series of Ganglia connected together by intervening cords, extending on each side of the vertebral column from the base of the skull to the Coccyx, and within the head. The two gangliated cords are connected at their Cephalic extremity by the Ganglion of Ribes, at their lower extremity by the Ganglion Impar. The Sympathetic has four Ganglia in its Cephalic portion, three in the Cervical, twelve in the Dorsal, four in the Lumbar, five in the Sacral and one in the Coccygeal portion. Each Ganglion is a distinct centre; their branches are of three varieties. First—Those of Intercommunication. Second—Those of communication with other nerves. Third—Those of supply to arteries, Ganglia, Viscera, etc. Each variety is composed of gray and white nerve fibres. The first variety has its gray fibres continuous with those of the spinal nerves which pass to the Ganglion. The second has white fibres which pass from the spinal nerve to the Ganglion, the gray fibres passing from the Ganglion to the spinal nerve. The third variety has a tendency to form intricate plexuses which encircle the blood vessels and are conducted by them to

the Viscera. The branches are mainly distributed to the Ganglia situated in the thorax and abdomen and are connected with the roots of the great vessels. These Ganglia are single and unsymmetrical, are called the Semilunar and Cardiac. The Cephalic portion is divided into the Opthalmic, Spheno-Palatine or Meckel's, the Otic or Arnold's and the Sub-Maxillary Ganglia. The Cervical portion of the Sympathetic consists of three Ganglia on each side—the Superior, Middle and Inferior Cervical. Their branches supply the Internal Carotid artery, External Carotid artery and many others; the Pneumogastric nerve, Hypoglossal, Cardiac nerves, Cervical nerves and many others, and form and join numerous plexuses.

The Carotid and Cavernous Plexuses.—The Carotid Plexus is situated on the outer side of the Internal Carotid Artery, communicates with the Gasserian Ganglion and Spheno-Palatine Ganglion. The Cavernous Plexus at the inner side or the Internal Carotid is principally formed by the ascending branch of the Superior Cervical Ganglion. It communicates with the third, fourth, fifth and sixth nerves and joins the latter by a second filament. A plexus from it is sent into the eyeball with the Arteria Centralis Retinæ.

The Cardiac Nerves—three in number on each side—Superior, Middle and Inferior, one being derived from each of the Cervical Ganglia.

The Cardiac and Coronary Plexuses.—The former is situated in front of the Tracheal

bifurcation formed by the Cardiac nerves derived from the Cervical Ganglia of the Sympathetic and the Cardiac branches of the recurrent Laryngeal and Pneumongastric.

The Posterior Cardiac Plexus is formed by the branches of the Great Cardiac Plexus and part of the Anterior Coronary Plexus. It sends a few filaments to the auricles of the heart and the pulmonary plexuses.

The Posterior Coronary Plexus is formed chiefly from filaments from the left side of the deep Cardiac Plexus, receiving a few from the right side, its branches supplying the muscular substance of the ventricles of the heart.

The anterior Cardiac Plexus formed chiefly from the Superficial Cardiac Plexus is directed to the anterior part of the heart.

Thoracic part of the Sympathetic consists of the same number of Ganglia as the vertebræ in that locality. Their external branches communicating with each of the Dorsal nerves.

The Great Splanchnic nerve is formed from branches of the fifth to the tenth Thoracic Ganglia and terminates in the Semilunar Ganglion, sending filaments to the Renal Plexus and Supra Renal Gland.

The Epigastric or Solar Plexus supplies all viscera in the Abdominal Cavity. It is situated between the stomach and aorta, and is a net work of nerves and ganglia. It surrounds the Cœliac axis, receives the Great Splanchnic nerves of both sides, part of the lesser Splanchnic nerves and the termination

of the right Pneumogastric. It gives off the following plexuses, Phrenic or Diaphragmatic, Cœlic, Gastric, Hepatic, Splenic, Supra-Renal, Renal, Superior Mesenteric, Spermatic and Inferior Mesenteric. The descriptive and suggestive names applied to them indicate their distribution and position. Branches from these plexuses form many other plexuses and the various branches which proceed from all of them ramify in every direction.

The Lumbar portion of the Sympathetic, situated in front of the Lumbar Vertebræ, consists of four connected ganglia of small size, gray color. The external branches communicate with the Lumbar Spinal nerves, the internal branches form the Lumbar, Aortic Plexus, and the Hypogastric Plexuses. By numerous branches they supply the bodies of the vertebræ and the ligaments that connect them.

The Pelvic portion is situated in front of the Sacrum, along the inner side of the Anterior Sacral Foramena, consisting of four or five ganglia connected together by Inter-Ganglionic cords, the parallel chain being connected at the front of the Coccyx by the Ganglion Impar. The internal branches assist in forming the Pelvic Plexus, and others form a plexus which accompany the middle Sacral artery. The external branches communicate with the last Sacral or the Coccygeal Ganglion.

The Hypograstric Plexus supplies the Viscera of the Pelvic cavity, situated in front

of the Promontory of the Sacrum, is formed from the Aortic Plexus, the Lumbar Ganglia and the two first Sacral Ganglia. It has no Ganglion and bifurcates below into two lateral portions which form the Inferior Hypogastric or Pelvic Plexus. It is situated beside the rectum and bladder, and distributes numerous branches to all the viscera of the pelvis. It gives origin to the Inferior Hemorrhoidal Plexus, Vesical Plexus, Prostatic and Vaginal Plexus, to the small Cavernous nerve, large Cavernous nerve and the Uterine nerves, which arise at the bottom of the plexus and accompany the Uterine arteries to the side of that organ between the layers of the broad ligament, and are distributed to the Cervix and lower part of the Uterus, penetrating its substance. Other filaments pass separately to the body of the womb and Fallopian tube, while branches from this plexus accompany the uterine vessels into the substance of the womb, and upon them numerous Ganglionic enlargements are found.

Organs of the senses are five in number—those of touch, smell, taste, hearing and sight, and are the instruments by which the mind is brought into relationship with external objects.

The Skin is the external covering of the body, an important excretory and absorbing organ, consisting of two layers, the Derma or Cutis Vera and the Epidermis or Cuticle. On the surface of the former are sensitive Papillæ, and beneath it are the sweat glands, hair Follicles and Sebaceous glands. The Derma

or true skin is tough, highly elastic, flexible. It consists of Fibro-Areolar tissue, inter-mixed with numerous blood vessels, Lymphatics and nerves.

The Cutis is divided into two layers, the deep layer or Corium and the Superficial or Papillary layer. The former consisting of strong, interlacing fibrous bands, composed mainly of white fibrous tissue, containing some yellow elastic tissue, and in it is a small amount of adipose tissue and sweat glands. This layer is from a quarter of a line to a line and a quarter, being thickest in the most exposed regions, and thicker in the male than in the female. Plain muscular fibres are found in the Superficial layer of the Corium wherever hair is found. The Papillary layer is situated upon the free surface of the Corium and consists of numerous small, highly sensitive vascular eminences, the Papilla, which rise perdendicularly from its surface and form the essential elements of the organs of touch. In form they are cone-shaped, apex pointing externally, and from 1-100 to 1-250 of an inch in diameter at their base. Where there is the greatest sensibility they are thickest, longest and largest, arranged in parallel curved lines forming the elevated ridges seen on the free surface of the Epidermis. The smaller Papilla contain a single capillary loop, but in the larger Papilla the vessels are convoluted to a greater or less degree, each also contains a nerve fibre. An oval-shaped body, called the Tactile Corpuscle, is found in the parts where touch is the most highly developed, as the

lips and palm of the hand. The nerve has some intimate relationship with this organ. It is situated in the principal part of the interior of the Papilla.

The Epidermis, Cuticle or Scarf Skin, is an Epithelial layer, accurately moulded on the Papillary layer of the Derma, the deeper and softer layers have been called the Rete Mucosum. Fine tubular prolongations from this layer are continued into the ducts of the Sudatory and Sebaceous glands. In structure the Epidermis consists of flattened cells agglutinated together and having a laminated arrangement. In the Superficial layers the cells are flattened, dry, transparent and firm, their contents converted into a kind of horny matter. As the external layers desquamate they are reproduced from beneath, being produced in the liquor sanguinis which is poured out on the free surface of the Derma.

The Black Skin of the Negro is caused by the presence of pigment in the cells, and is more pronounced in the Rete Mucosum. The arteries of the skin are very numerous. They form a dense Capillary Plexus in the deeper part and supply the Sudatory and Sebaceous glands and hair Follicles, terminating in the Superficial layer of the Corium in a fine Capillary net-work from which numerous fine branches ascend to the Papillæ. Lymphatics are inter-woven with the Capillary nervous plexus. The nerves form a plexiform net from which the terminal nerve fibres pass to the Papillæ.

Appendages of the Skin are the nails,

hair, Sudoriferous and Sebaceous glands and their ducts. The nails are modifications of the Epidermis, consisting essentially of the same Cellular structure as that membrane. Each nail is convex on its outer surface, concave within, implanted by a portion called the root into a groove of the skin, the exposed portion is called the body, the anterior extremity the free edge. The matrix is that part of the Cutis between the body and root of the nail, and from it the nail is produced. The nail is shell-like or squamous in shape, situated on the terminal phalanx of each of the phalanges on its upper part, and is of pliable, horny texture.

Hairs are peculiar modifications of the Epidermis consisting essentially of the same material. They are found all over the body excepting the soles and palms, and vary in length, thickness and color in different parts of the body. A hair consists of a root—the part implanted in the skin, a shaft—the part projecting outward from the skin, and a point. The root is bulbous and lodged in a hair Follicle, and has opening into it one or more Sebaceous glands. At the bottom of the hair Follicle is a small, conical-shaped, vascular eminence or papilla, similar in every respect to those found upon the surface of the skin. It is continuous with the dermic layer of the skin and is probably supplied with nervous fibrils. This is the part through which the material is supplied to form and perpetuate the growth of the hair. The color of the hair is dependent on pigment—its quantity deter-

mining the shade. The shaft consists of a central part or Medulla, (which ceases near the point) surrounding this is the fibrous portion, covered externally by the cortex, which consists of thin scales.

The Sweat Glands or Sudoriferous glands are the organs by which a large amount of gaseous and aqueous material is excreted from the surface of the body. Their number in the body is 2,381,248. In the neck and back there are 417 to the square inch, 28,000 in the palm of the hand on the same surface. They are spiral in form, measuring 1-15 of an inch in length when straightened out. Their orifices open at the outer surface of the skin, their action is continual; when the excretion is abundant it is called sweat. In the larger glands their duct divides and subdivides dichotomously. Their bases are in the Corium or the Sub-Cutaneous Areolar tissue. Contents of their smaller tubes is liquid, of the larger tubes, colored granules and cells which simulate epithelial cells.

The Sebaceous glands secrete an oily substance which emits a peculiar odor, existing all over the body excepting the palm and soles. They are situated in the Corium or Sub-Dermoid tissue, are small Saculated glandular organs frequently opening into the hair follicles. The largest variety are the Meibomian glands of the eyelid.

The Tongue, the organ of the special sense of taste, situated in the cavity of the mouth, between the sides of the Inferior Maxillary bone, its free end terminating near

the front teeth. Its root is situated backward and connected with the Os-Hyoides by numerous muscles, to Epiglottis by the Glosso-Epiglottic ligament, and the soft palate and pharynx by the Anterior and Posterior pillars of the fauces. The under-surface is connected to the Inferior Maxillary by the Genio-Hyo-Glossi muscles, and by reflexion of the mucous membrane of the gums; to the Hyoid bone by the Hyo-Glossal membrane, and in front the Fraænum Linguæ (which is a fold of mucous membrane). The tongue is enveloped in mucous membrane, supporting numerous Papilla on its upper or Dorsal surface giving it its rough appearance. The Papilla is covered with a layer of Epithelium.

The Papilla is of three varieties—Fungiform, Filiform and Circumvallate. The latter are the largest and are eight or ten in number, situated at the back part of the dorsum, arranged in V shape, the apex pointing backward. The Fungiform Papillæ are more numerous than the fore-going, but are scattered irregularly over the dorsum, and more thickly at the sides and apex. They are recognized by their large size, deep red color and rounded eminences. The Filiform Papillæ cover the anterior two-thirds of the dorsum of the tongue very minute, running parallel with the Circumvallate Papillæ, but arranged transversely at the tip of the tongue. The thickness of their Epithelium gives to them a whitish color. Simple Papillæ are scattered very unequally among the compound forms, and sparingly found behind the Circumvallate.

Nerves are distributed abundantly and in the Fungiform terminate in a brush-like expansion—one or more Capillary loops supply each gland.

Follicles are found between the Circumvallate glands and the Epiglottis.

The Mucus glands are mainly found in the posterior third of the dorsum of the tongue, form a little group at its tip, a few along its edges and some in front of the Circumvallate. They are similar to the Labial and Buccal.

The Epithelium of the tongue is of the scaly variety.

A Fibrous Septum in the middle, running longitudinally, divides the tongue in two symmetrical, separate halves, each being composed of muscular fibres arranged in various directions. Nerves of the tongue are the Gustatory, Lingual and Hypoglossal.

The Nose is the organ of the special sense of smell, assisting the tongue to discriminate food. The nose is external. The internal part is the nasal fossa. The former is the most prominent, external, and anterior. It is situated in the median line below the Oss Frontis (with which it is connected,) and above the upper lip where it projects forward from the face. The lower part presents at its bottom two orifices called nostrils. They are separated from each other by an Antero-Posterior Septum, the Columna. The nose is composed of bones and cartilages, the former at its upper part. The two nasal bones, which are flat and situated in a V shaped form, the apex

looking upward, and the nasal processes of the Superior Maxillary bone. The latter are the upper lateral, lower lateral, two sesamoid and the cartilage of the Septem.

The Muscles of the nose are situated beneath the integument. (Refer to chapter on muscles.) It receives its blood supply from the Lateralis Nasi and nasal arteries. The veins terminate in the Facial and Opthalmic. Its nerves are branches from the Facial, the Infra-Orbital, Infra-Trochlear and a filament from the nasal branch of the Opthalmic.

The Nasal Fossæ are two irregular cavities in the middle of the face extending from before backward. They open in front by the Anterior Nares, and behind in the pharynx by the Posterior Nares. They are lined with mucous membrane called the Schneiderian or Pituitary membrane, and covered with a layer of Tessellated Epithelium at the upper part where the Olfactory nerve is distributed, ciliated in the rest of its extent excepting near the aperture of the nares.

In the Superior Meatus the aperture of communication with the Posterior Ethmoidal cells is considerably diminished in size, and the Spheno-Palatine Foramen completely closed in.

In the middle meatus the opening of the Infundibulum is partially hidden by a projecting fold of mucous membrane, and the orifice of the antrum is contracted to a small circular aperture, much narrower than in the skeleton.

In the Inferior Meatus, the orifice of the nasal duct, is partially hidden by a single or double valvular mucous fold, and the Anterior Palatine canal either completely closed in or in a tubular cul-de-sac of mucous membrane is continued a short distance into it. In the roof, the opening leading into the Sphenoidal Sinus, is narrowed and the aperture in the Cribriform plate of the Ethmoid completely closed in, Arteries of the nasal fossæ are the Anterior and Posterior Ethmoidal, Spheno-Palatine and Alveolar. Veins form a close network beneath the mucous membrane, the larger branches accompany the arteries. The Nerves are the Olfactory, nasal branch of the Opthalmic, filaments from the Anterior Dental branch of the Superior Maxillary, Vidian, Naso-Palatine, descending Anterior Palatine and Spheno-Palatine branches of Meckel's Ganglion.

The Eye-ball, contained in the cavity of the orbit, is spherical in form, having the segment of a smaller and more prominent sphere engrafted upon its anterior. The latter is the Cornea and is transparent. The eye-ball is composed of three tunics: First, Sclerotic and Cornea; second, Choroid, Iris and Ciliary processes; third, Retina. The refractory media or humors are contained within the center of the hollow eye-ball, and are the Aqueous, Crystalline (lens) and Capsule and Vitreous. The Sclerotic is hard, dense and unyielding composed of white fibrous tissue, intermixed with elastic tissue, fusiform and nucleated cells, preserving the

requisite correct curvature of the eye. Externally it is white; internally it is brown, covered externally by the conjunctival membrane which gives the brilliancy to the front of the eye. The Cornea is formed by the conjunctiva, anterior elastic lamina, the Cornea proper, posterior elastic lamina and a transparent membrane lining the anterior chamber of the eye-ball (named from before backward). The second and fourth layers are analogous in structure and present the remarkable quality of maintaining their transparency under water, alcohol or acids, but become opaque by pressure or tension. The Cornea is non-vascular, the capillaries terminating in loops at its circumference. Its nerves are numerous and derived from the Ciliary. The Choroid is the vascular and pigmentary tunic, investing the posterior five-sixths of the eye-ball, the Ciliary process being its appendage developed from its anterior surface. The Choroid is formed of three layers—external, middle and internal. The former is formed by the larger branches of the short Ciliary arteries which run forward between the veins before they bend downward to terminate on the inner surface. They converge to form four or five equidistant trunks. Star-shaped pigment cells are disposed in this layer. The middle layer consists of an exceedingly fine capillary plexus and is called the Tunica Ruyschiana, formed by the short Ciliary vessels. The internal layer is a delicate membrane consisting of a single layer of hexagonal nucleated cells, thickly studded with

pigment granules, each containing a nucleus.

The Iris is a thin circular shaped contractile curtain suspended in the aqueous humor behind the Cornea, in front of the lens, being perforted at the nasal side of the center by a circular aperture, the pupil. It contains pigment cells which give the color of the eye, their number determining its shade. Its fibrous tissue is arranged in the form of parallel circles around the pupil, and fibres running from the center to the circumference—both of the involuntary variety. Its blood supply brought by the long and Anterior Ciliary arteries and vessels from the Ciliary processes.

The Ciliary ligament connects the Iris to the Sclerotic and Cornea.

The Ciliary Muscle is a grayish, semi-transparent, circular band, an eighth of an inch thick, situated on the outer surface of the forepart of the Choroid, and is of unstriped fibres. Its duty is to regulate the eye to focus at different distances.

The Retina is a delicate nervous membrane upon the surface of which the images of external objects are formed. Its outer border is in contact with the pigmentary layer of the Choroid. In the center of the eye posteriorly is a small, elevated, yellow spot called the "yellow spot of Sommering." At the inner side of this is the opening for entrance of the optic nerve; which pierces the eye a little at the nasal side of its center. The Retina is composed of three layers, together with the blood vessels—the external or col-

umnar layer, middle or granular layer, and the internal or nervous. The former is very thin and consists of columnar rods, solid, of nearly uniform size and arranged perpendicularly to the surface, and bulbous particles or cones interspersed at regular intervals among the former. The middle layer is composed of two layers. The external is the thicker and its constituent particles are globular. The internal layer is composed of particles that look like pieces of coin seen edgewise. The internal layer consists of the expansion of the terminal fibres of the optic nerve, which in this region consists only of the central part or axis of the nerve tubes.

The Membrana Limitans lines the Retina. It is very delicate and structureless. The Arteria Centralis Retinæ and vein pierce the optic nerve and enter the globe of the eye through the porus opticus.

The Aqueous Humor completely fills the anterior and posterior chamber of the eye-ball. It is of four or five grains weight and consists of water containing a small amount of chloride of sodium. The anterior chamber is the space bounded in front by the Cornea; behind by the front of the Iris and Ciliary ligament. The Posterior Chamber is bounded in front by the back of the Iris; behind by the capsule of the lens, its capsule and its suspensory ligament and the Ciliary processes. They communicate through the pupil, but before birth the pupil is closed by the Membrana Pupilaris.

The vitreous body fills four-fifths of

the entire globe filling the cavity of the Retina, hollowed in front for the reception of the lens and its capsule. It is perfectly transparent, of the consistency of jelly and consists of an albuminous fluid inclosed in a delicate, transparent membrane the Hyaloid. This membrane invests the outer surface of the vitreous body. It is intimately connected in front with the suspensory ligament of the lens and is continued into the back part of its capsule. The fluid from the vitreous humor resembles nearly pure water, but contains some salt and albumen.

The Crystalline Lens, enclosed in its capsule, is situated immediately behind the pupil, in front of the vitreous body, and surrounded by the Ciliary processes which slighly overlap its margin. Its capsule is a transparent, highly elastic, but brittle membrane which closely surrounds the lens. The Lens is a transparent, double convex body, the convexity being greater on the posterior than the anterior surface. Its transverse diameter is one-third of an inch, its antero-posterior about one-quarter, and consists of three triangular segments, the sharp edges of which are directed towards the center, the bases outward. In the fœtus its form is nearly spherical, its color reddish and its consistency soft. In old age its surfaces are flattened, somewhat opaque, of an amber color, and increased in density. The Suspensory Ligament connects the anterior margin of the retina, to the anterior margin of the lens, near its circumference. It assists in

maintaining the lens in position.

The Canal of Petit is about one-tenth of an inch wide, is bounded in front by the suspensory ligament, behind by the Hyaloid membrane, its base being formed by the capsule of the lens. The arteries of the globe of the eye are the long, short and Anterior Ciliary, and the Anteria Centralis Retina.

The Veins are four in number, are formed mainly by branches from the surface of the Choroid that perforate the Sclerotic midway between the Cornea and Optic nerve. Nerves of the eye-ball are the Optic, the long and short Ciliary nerves. The former derived from the nasal branch of the Opthalmic, the latter from the Ciliary Ganglion. Appendages of the eye are the eye-brows, eye-lids, and conjunctiva; the Lachrymal apparatus, (which includes the Lachrymal Gland,) the Lachrymal Gland and the nasal duct.

The eye-brows or Supercilia are two arched eminences of integument which surmount the upper circumference of the Superciliary ridge, on either side, and support short, thick hairs directed obliquely outward so as to lie flat.

The eye-lids, Palpebræ, are two thin, movable folds, placed in front of the eye which they protect by closing. The Fissura Palpebrarum is the space between its open margins. Its nasal angle is called the inner canthus, the external angle, the outer canthus. The Lachrymal canal begins at the inner canthus in a small hollow tubercle, the Lachrymal Papilla. The

eye-lids are composed of integument, areolar tissue, fibres of the Orbicularis muscle, (which possess involuntary action also) tarsal cartilage, fibrous membrane, Mebomian glands and conjuctiva. The upper lid has in addition aponeurosis of the levator palpebræ.

The tarsal cartilage is a thin elongated plate an inch in length contributing to the lid's form and support.

The Lachrymal gland is situated at the outer canthus. It secretes the tears which are conveyed to the anterior surface of the eye by seven or eight ducts, which is conveyed to the nasal cavity through the nasal duct. The latter is dilated at its upper extremity called the Lachrymal Sac. The duct is about three-quarters of an inch in length.

The external ear, pinna or auricle is composed of yellow cartilage, surrounds the external auditory meatus. Its purpose is to collect vibrations of sound and conduct them to the Tympanum. Its fibro cartilages are frequently folded on each other marking the surfaces into numerous eminences and depressions. The external rim of the ear is called the Helix. Internally and parallel with this is a groove, and a second elevation, the former called the fossa of the Helix, the latter the Anti-Helix, which bifurcates at its upper part. The depression between the upper termination is called the fossa of the Anti-Helix.

The Concha is a depression a little above and posterior to the external auditory meatus.

Posterior to the opening is a blunt, pointed projection—the tragus. The anti-tragus is shaped similar to the tragus and is situated slightly below and posterior to it. The lower termination of the ear is soft, composed of tough areolar and adipose tissues, and called the lobule.

The muscles of the ear which extend from one part of the auricle to the other are the Helicus major, and minor, Tragicus, Anti-Tragicus, Transverse Auriculæ, Obliquus Auris.

The Meatus Auditorius Externus is the canal leading from the concha to the Membrana Tympani. Its length is about an inch and a quarter; its direction is obliquely forward and inward, and is a little higher in the middle than at either extremity. The cartilaginous and membraneous portion is the external half inch of its length, the inner remaining part being osseous.

The Ceruminous glands which secrete the ear wax, are thickly set in the cartilaginous part, their ducts opening on the surface. The middle ear or Tympanum is an irregular cavity within the petrous (stony) portion of the temporal bone. It is filled with air and communicates with the pharynx by the Eustachian tube, and contains a chain of bones which connect the Membrana Tympani with the Labyrinth and serve to convey the vibrations commuuicated to the Membrana Tympani across the cavity of the Tympanum to the internal ear. The cavity of the Tympanum measures about five lines from before back-

ward, three lines in the vertical direction, and two or three in the transverse. Its outer wall presents three small apertures—the Iter Chordæ Posterius, Glaserian Fissure and the Iter Chordæ Anterius. The former gives egress to the Chorda Tympani nerve and the latter gives it exit.

The Glasserian Fissure gives passage to some tympanic vessels, the laxator tympani muscle and the long process of the malleus. The internal wall presents the following parts for examination: The Fenestra Ovalis, Fenestra rotunda, Promontory, ridge of the Aquæductus Fallopii, Pyramid and opening for the Stapedius. The Fenestra Ovalis is a kidney-shaped opening leading from the Tympanum into the vestibule. The Fenestra rotunda leads into the Cochlea. The promontory is a hollow, rounded prominence formed by the projection outward of the first turn of the Cochlea. Three small grooves on its surface lodge nerves from the Tympanic Plexus. The Aquæductus Fallopii contains the Portio Dura.

The Pyramid, a hollow rounded eminence, contains the Stapedius muscle; its summit gives exit to its tendon; it communicates with the Aqueductus Falopii. The posterior wall presents the opening of the mastoid cells which have several small openings. They communicate with the canals that lead into large irregular cavities contained in the interior of the mastoid process. The anterior wall presents the canal for the tensor Tympani, orifice of the eustachian tube and the

processus Cochleariformis. The latter separates the two former that open near together.

The Membrani Tympani separates the cavity of the Tympanum from the bottom of the external meatus. It is a thin transparent membrane, nearly oval in form and directed very obliquely downward and inward. Its circumference is contained in a groove at the inner end of the meatus which skirts the circumference of this part excepting above. The handle of the malleus descends vertically between the middle and inner layers of this membrane as far down as its center, where it is firmly attached, drawing the membrane inward so that its outer surface is concave, its inner convex. It is composed of three layers, external or circular, a middle or fibrous, and internal or mucus. The vessels pass along the handle of the malleolus, are distributed to its layers.

The bones of the ear are the Malleolus (mallet shaped), Incus (anvil shaped), and Stapes (a stirrup). The former is connected to the Membrana Tympani, the latter to the Fenestra Ovalis. These small bones are connected together, and with the Tympanum, by ligaments (three in number), and moved with small muscles—the Tensor Tympana, Laxator Tympani and Stapedius. The former draws the Membrana Tympani inward increasing its tension. The Laxator Tympani relaxes the Tympanum by drawing the malleus outward. The Stapedius compresses the contents of the vestibule by depressing the back part of the Stapes, raising its forepart.

Arteries of the Tympanum are, Tympanic branch of the Internal Maxillary, the Stylo-Mastoid branch of the Posterior Auricular, supplies the back part of the Tympanum and Mastoid cells, the smaller branches being the Petrosal branch of the middle Meningeal and branches from the ascending Pharyngeal and Internal Carotid.

The veins of the Tympanum terminate in the middle Meningeal and Pharyngeal veins, and through these to the Internal Jugular.

Nerves.—The Tensor Tympani is supplied by a branch from the Otic Ganglion, the Laxator Tympani and Stapedius by filament from the facial. Those supplying the lining membrane are derived from the Tympanic Plexus.

The Internal Ear or Labyrinth is the essential part of the organ of hearing, receiving the ultimate distribution of the auditory nerve. It consists of the Vestibule, Semi-Circular Canals and Cochlea. Within the Osseous Labyrinth is the Membranous Labyrinth upon which the ramifications of the auditory nerve are distributed.

The vestibule is the common central cavity of communication between the parts of the internal ear. It measures about two lines. Filaments of the auditory nerve pass through the Fovea Hemispherical on its inner wall.

The Semi-Circular Canals are three bony canals, the Superior, Posterior and External or Horizontal; situated above and behind the vestibule, and are about one-twentieth of an inch in diameter, having an enlargement at their ends, the Ampulea. They open into the

vestibule by five orifices.

The Cochlea is formed like a snail shell, and forms the anterior part of the labyrinth. Its apex is directed forward and outward. Its base is perforated by numerous apertures for the transmission of the Cochlear branch of the auditory nerve. The Cochlea has a central axis, the Modiolus or Columella; around this is wound the spiral canal—two turns and a half—extending from its base to its apex. It is about an inch and a half in length and diminishes in size from its base to its summit, its commencement being about a line in diameter. Its interior is divided by a thin osseous and membranous layer—the laminia spiralis—which is the essential part of the Cochlea on which the nerve tubules are distributed. The Osseous Labyrinth is lined by a delicate membrane that secretes the perilymph, aqua labyrinthi, or liquor Cotunnii.

The Membranous Labyrinth is a closed membranous sac containing liquid. Upon its wall the ramifications of the auditory nerve are distributed. The vestibular portion consists of two sacs, the Utricle and Saccule; the former is the larger.

The Membranous Semicircular canals are about one-third the diameter of the osseous canals, but in number, shape, and general form they are precisely similar. They open by five orifices into the utricle. The membranous labyrinth is semi-transparent and consists of three coats. The outer layer is a loose and flocculent tissue, containing blood vessels and numerous pigment cells anala-

gous to those in the Choroid. The middle layer is thicker, but more transparent and bears some resemblance to the hyaloid membrane. The inner layer is formed of polygonial, nucleated, epithelial cells which secrete the endolymph, which resemble the perilymph and fills the membranous labyrinth.

The Otolyths are small particles of crystalized carbonate of lime contained in the wall of the utricle and saccule opposite distribution of the nerves.

Arteries of the Labyrinth are the internal auditory, (from the Basilar,) Stylo-Mastoid, (from the Posterior Auricular,) branches from the Occipital, Cochlear and Vestibular, from the Internal Auditory.

Veins of the Vestibule and Semicircular canals accompany the arteries, and receiving those of the Cochlea at the base of the Modiolus, terminate in the Superior Petrosal Sinus.

Digestion.—The apparatus for the digestion of the food consists of the alimentary canal and certain accessory organs. In the mouth the food is divided (mastication), and mixed with a fluid, the saliva, constituting ensilivation; farther down it is swallowed (deglutition). The food then passes into the stomach where the chief, chemical, necessary changes occur. Passing onward and downward the food comes in contact with the bile and pancreatic fluid in the small intestine. This converts the nutritive parts of the food into chyle, which fits it for absorbtion; the unfit remainder passes into the large intestine to

be cast off as waste material.

The mouth is placed at the upper part and is the beginning of the alimentary canal; is a nearly oval cavity. It is bounded in front by the lips, laterally by the checks, above by the hard palate and upper teeth, below by the tongue, the mucous membrane stretched across the under surface of this organ and the inner surface of the jaws, and by the teeth of the lower jaw; behind by the soft palate and fauces.

The Lips are two fleshy folds which surround the orifice of the mouth, formed externally of integument, internally of mucous membrane; between the two are the orbicularis oris muscle, the Coronary vessels, some nerves, areolar tissue, fat, and numerous small labial glands.

The Frænum Labii Superioris, and Frænum Labii Inferioris serve to attach the lips to the gums in the median line. The former attaching the upper, the latter the lower lip. The labial glands are placed between the mucus membrane and the orbicularis oris.

The Cheeks form the sides of the face, and are continuous in front with the lips, and are composed of a layer of integument and mucous membrane, enclosing a muscular stratum, a quantity of fat, areolar tissue, nerves, vessels and buccal or molar glands, the latter placed between the mucus membrane and the Buccinator muscle, their common duct opening opposite the last molar tooth.

The Gums are composed of a dense fibrous

tissue connected to the periosteum of the alveolar process, and surrounds the necks of the teeth.

The Teeth are divided into the decidous or milk teeth and the permanent teeth. The former for infancy and youth, and are twenty in number—four incisors, two canine and four molars in each jaw. The permanent teeth are thirty-two in number—four incisors, two canine, four bicuspids and six molars in each jaw. Each tooth consists of a crown (which projects above the gum), a root, (strongly inserted in the alveolus,) and a neck, a constricted portion between the two.

The Incisors are chisel-shaped with one root, set in front, their form indicating their purpose—cutting.

The Canine teeth are cone-shaped, and placed behind the preceeding has a heavy single root. Their purpose is tearing and piercing.

The Bicuspid are placed behind the canine, their crown having two pyramidal eminences.

The Molars, largest teeth, are situated posteriorly, their crown nearly cubical is mounted by four or five tuburcles.

The Wisdom tooth appears very late. The upper molars have three roots, the lower have two.

The Temporary teeth are smaller, but partake of the form of the permanent teeth. About the sixth week of foetal life a groove appears in the mucous membrane of the edge of the upper jaw. From its floor the teeth originate; the germ of each tooth is

formed by a conical elevation of mucus membrane. The molar of the upper jaw appears the seventh week, eighth week the canine, incisors the ninth week, second molar the tenth week. The teeth of the lower jaw appear sometimes two weeks later. After birth, about the seventh month, appear the central incisors, seventh to the tenth month appear the lateral incisors, from the twelfth to the fourteenth month the anterior molars, from the fourteenth to the twentieth month the canine teeth, and from the eighteenth to the thirty-sixth month the posterior molars. The eruption of the permanent teeth begins at six and one-half years, when the first molars appear, seventh year the middle incisors, eighth years the lateral incisors, ninth year the first bicuspid, tenth year the second bicuspid, eleventh to twelfth year the canine, twelfth to thirteenth year the second molars, seventeenth to twenty-first year the wisdom teeth.

The Palate consists of a hard and soft portion. The former the anterior, the latter the posterior part of the roof of the mouth.

The hard palate is bounded in front and at the sides by the alveolar arches and gums. Behind it is continuous with the soft palate. Its mucous membrane is thick, pale in color, and corrugated, underneath which lie numerous palatal glands.

The soft palate, or velum pendulum palati, is a movable fold, suspended from the hard palate, forming an incomplete septum between the mouth and pharynx. It consists of a fold of mucous membrane, inclosing

muscular fibres, an aponeurosis (which is thin but firm), vessels, nerves and mucus glands. Its lower border is free; its sides are blended with the pharynx. Hanging from its lower border is the uvula, and at each side is situated the pillars of the fauces, which consist of muscular fibres enclosed in mucus membrane. The anterior pillar extending to the base of the tongue forms palato-glossus muscle. The posterior pillars, the larger, run downward and backward to the sides of the pharynx, and are formed by the projection of the palato-pharyngi muscles.

The Tonsils are two glandular organs, situated one on each side of the fauces, between the anterior and posterior pillars. They contains glands similar to those of Peyer.

Arteries of the tonsil are the Dorsalis linguæ, ascending palatine, tonsillar, ascending pharyngeal and descending palatine.

The veins terminate on the outside of the tonsil to form the tonsillar plexus. Its nerves are derived from the fifth and the glosso-pharyngeal.

The Salivary glands are the parotid, sub-maxillary and sub-lingual (principally). The former is the largest, weighs from one-half to one ounce, and is situated in front of and below the external ear, limited in front by the ramus of the inferior maxillary. Its liquid is carried into the mouth by Steno's duct (about the size of a crow's quill), which opens at a point opposite the second molar tooth. It receives the duct of the socia parotidis, which occasionally exists as a separate lobe.

Arteries of the Parotid gland are derived from the external Carotid. Its nerves are from the carotid plexus of the sympathetic, facial, temporal, superficial, and the great auricular nerves.

The Sub-Maxillary gland is situated in the anterior part of the sub-maxillary triangle of the neck below the jaw. It weighs two drachms; its form is irregular. It is separated from the parotid gland by the stylo-maxillary ligament, and from the sub-lingual gland by the myo-hyoid ligament. Its duct (Wharton's) opens in the cavity of the mouth at the side of the fraenum linguae. It is supplied by branches of the facial and lingual arteries. The veins follow the course of the arteries. Its nerves are from the sub-maxillary ganglion, the myo-hyoid branch of the inferior dental, and the sympathetic.

The Sub-Lingual gland, the smallest of the three, is situated below the mucous membrane in the floor of the mouth. Its weight is about a drachm. Its duct (of Bartholine) opens into Wharton's duct and is formed by several of its smaller excretory ducts (ductus Riviniana) which open separately into the mouth, and number from eight to twenty. The sub-lingual and sub-mental arteries supply the gland. Its Nerves are derived from the Gustatory. Structure. The Salivary are conglomerate glands, consisting of numerous lobes, composed of smaller lobes, connected together by dense areolar tissue, vessels, and ducts. Each globule consists of numerous closed vesicles, which open into a common duct.

The Pharynx is that part of the alimentary canal which is placed behind the nose, mouth, and larynx. It is a musculo-membranous sac, somewhat conical in form, base upward, apex downward and terminating in the œsophagus, extending from the under surface of the skull, to the cricoid cartilage in front, and the sixth cervical vertebræ behind. It is about 4½ inches in length, broadest in its transverse diameter. It communicates with the two posterior nares, two eustachian tubes, the mouth, larynx, and œsophagus. It is composed of a mucous, muscular, and fibrous coat. Beneath its mucous membrane are found the compound follicular, and the racemous glands, the latter being most numerous at the upper part of the pharynx.

The Oesophagus is a membranous canal about nine inches in length, extending from the pharynx to the stomach. Commencing at the lower border of the cricoid cartilage, it descends in front of the spine, behind the trachea, passes through the diaphragm, it opens into the cardiac end of the stomach, opposite the ninth dorsal vertebra. It has a mucous, cellular, and muscular coat. It is lubricated by numerous small compound glands. It has three coats, muscular, cellular, and mucous, the first consists of two layers—longitudinal and transverse.

The Abdomen is the largest cavity of the body. It is bounded above by the diaphragm, below by the brim of the pelvis,

in front, and at the sides, by the lower ribs, the transversales muscles, and venter ilii,—and behind by the vertebral column, and the psoas and quadrati lumborum muscles. This cavity contains the greater part of the alimentary canal, some of the accessory organs to digestion, the liver, pancreas, spleen, and the kidneys and supra-renal capsules.

Apertures of the abdomen are the umbilicus, (for the transmission of the umbilical vessels, in the foetus,) the caval cavity of the diaphragm, (for the transmission of Inferior Vena Cava,) the Aortic opening (for the passage of the Aorta, Vena Azygos, and thoracic duct), and the oesophageal opening for the oesophagus and pneumogastric nerves. Below there are two openings on each side, one for the passage of the femoral vessels, and the other for the transmission of the spermatic cord in the male, and the round ligament in the female. To facilitate its description the abdomen is divided into nine regions, by drawing around the body two circular lines one parallel with the cartilages of the ninth ribs and the lower one with the highest point of the crest of the ilia, the cavity is divided into three zones, an upper, middle, and lower. Two parallel lines are drawn from the cartilage of the eighth rib on each side, down to the center of the Poupart's ligament, each zone is subdivided into three parts.

These regions are named from above downward, in the right tier—the right hypochondriac, right lumbar, and right in-

guinal. The left tier named from above downward are—the left hypochondriac, left lumbar, and left inguinal. The middle regions from above downward are—the Epigastric, Umbilical, and Hypogastric regions.

The Right Hypochondriac Region contains the right lobe of the liver and gall bladder, duodenum, hepatic flexure of the colon, upper part of right kidney and supra-renal capsules.

The Right Lumbar Region contains the ascending colon, lower part of the right kidney, and some convolutions of the small intestines.

The Right Inguinal Region contains the Caecum, appendix caeci, ureter, and spermatic vessels.

The Epigastric Region contains the middle, and pyloric end of the stomach, left lobe of the liver, lobus spigelii, hepatic vessels, coeliac axis, semilunar ganglia, pancreas, parts of the aorta, vena cava, vena azygos, and thoracic duct.

The Umbilical Region contains the transverse colon, part of the great omentum and mesentery, transverse part of the duodenum, and some convolutions of the jejunum and ileum.

The Hypogastric Region contains convolutions of the small intestine, the bladder in children, (and in adults if distended,) and the uterus during pregnancy.

The Left Hypochondriac Region contains the splenic end of the stomach, the spleen, extremity of the pancreas, the splenic flexure

of the colon, upper half of the left kidney, and left supra renal capsule, and part of the left lobe of the liver.

The Left Lumbar Region contains the descending colon, lower part of the left kidney, and some convolations of the small intestines.

The Left Inguinal Region contains the sigmoid flexure of the colon, ureter, and spermatic vessels.

The Peritoneum is a serous membrane, and a shut sac, in the male;—the fallopian tubes communicating with it in the female. It partly invests all the organs of the abdomen, and pelvis, forming their visceral membrane, and is then reflected upon the internal surface of the parietes of these cavities forming the parietal layer.

The free surface of the Peritoneum is smooth, moist, and covered by a thin squamous epithelium. Its attached surface is rough, being attached to the viscera, and the inner surface of the parieties by the sub-peritoneal areolar tissue. Numerous folds are formed by its reflexion on various organs, which serve to bind them in place, at the same time they enclose the vessels and nerves proceeding to the organ. Some of these folds are called mesentaries, and connect the intestine to the abdominal wall; others are called ligaments, and support the organs in position. Those folds proceeding from one viscus to another are called omenta.

The Ligaments formed by the folds of the peritoneum are those of the liver, spleen, bladder, and uterus.

The Omenta are the lesser, or gastro-hepatic, the greater or gastro-colic, and the gastro-splenic omentum. The mesentaries formed by the peritoneum are the mesentary proper, the mesocæcum, the ascending, transverse, descending mesocolon, sigmoid mesocolon, and the mesorectum. (The names given to the above are suggestive, and partly explanatory of their position, &c.)

The Stomach is the principal organ of digestion, and is the most dilated part of the alimentary canal. Chymification is here accomplished. Its form is irregularly conical, its upper or Cardiac orifice, or œsophageal opening, communicates with the œsophagus; the lower opening or pylorus, communicates with the duodenum, and is guarded by a valve. Its left extremity is called the greater or splenic end. Its lesser curvature extends between the two openings of the stomach along its upper or concave border, the greater curvature extending between the orifices on its lower border. Its left extremity is called the splenic end. Its anterior surface directed upward and forward is in relation with the diaphragm, the under surface of the left lobe of the liver, and in the epigastric region, with the abdominal parieties. Its lower surface is in relation with the pancreas, and great vessels of the abdomen, the crura of the diaphragm, and the Solar Plexus.

The Stomach is held in position by the lesser omentum, and the gastro-phrenic ligament.

The Stomach consists of a serous, muscular, cellular, and mucus coat, and is situated in the epigastric, left hypochondriac, and part of the right hypochondriac regions. Its weight is about four and a half ounces, its transverse diameter (when moderately distended) is about twelve inches, its vertical diameter, four inches. The muscular coat consists of three layers—longitudinal, transverse, and oblique. The mucous membrane lies in folds when the organ is empty, is smooth and velvety, pink in childhood, straw-colored in age. The gastric follicles are situated thickly over its surface; in some parts the follicles are filled with nuclei, and granules, and above these a mass of nucleated cells, the upper fourth of the tube being lined with columnar epithelium. They are then called the peptic glands. Toward the pylorus the tubes are lined with columnar epithelium and are called mucous glands.

Arteries of the Stomach are the gastric, pyloric, and right gastro-epiploic branches of the hepatic, the left gastro-epiploic, and vasa brevia from the splenic.

The Veins accompany the arteries, and terminate in the splenic and portal veins.

The Lymphatics are numerous and consist of a deep and superficial set.

The Nerves are terminal branches of the right and left pneumogastric, the former distributed upon the back, the latter upon the front part of the stomach. Branches from the sympathetic also supply the organ.

The Alimentary canal is a musculo-mem-

branous tube extending from the mouth to the anus, lined throughout its extent by mucous membrane. It consists of a small and large intestine; the former is divided into the Duodenum, Jejunum, and Ileum,—the latter is divided into the Cæcum, Colon, and Rectum.

The small intestine is a convoluted tube about 20 feet in length which gradually diminishes in size from its commencement to its termination. It is situated in the abdominal and pelvic cavities, surrounded by the large intestine.

The Duodenum is the widest, shortest, most fixed part of the small intestine. It presents a horse-shoe shaped curve, and is divided into an ascending, descending, and tranverse portion.

Its Arteries are the pyloric and pancreatico-duodenal branches of the hepatic, and the inferior pancreatico-duodenal branch of the superior mesenteric.

The Veins terminate in the gastro-duodenal and superior mesenteric.

Its Nerves are derived from the solar plexus.

The Jejunum—the second division—is about 8 feet in length, commencing at the left side of the second lumbar vertebra, its convolutions being chiefly confined to the umbilical, and left iliac regions.

The Ileum includes the remainder of the small intestine, and occupies the umbilical, hypogastric, right iliac, (occasionally the pelvic regions,) and terminates in the right

iliac fossa, by opening into the inner side of the large intestine. The wall of the small intestine is composed of four coats,—the serous, muscular, cellular, and mucous. The former is derived from the peritoneum.

The Muscular coat is composed of two layers, an external or longitudinal, and an internal or circular.

The Cellular coat connects together the mucous and muscular layers. The inner or mucous coat is thick and highly vascular above, paler and thinner below, and presents for examination four varieties of glands—Simple follicles, Duodenal glands, Solitary glands, and the Agminate or Peyer's glands.

The Epithelium of the intestine is of the Columnar variety.

The Valvulæ Conniventes, or foldings of the mucous membrane and submucous tissue, extend around the intestine three-fourths of its circumference. Large and small folds alternate with each other, and begin about two inches below the pylorus. They increase the absorbing surface.

The Villi are minute, highly vascular, processes projecting from the surface of the mucous membrane of the intestine throughout its whole course.

In shape they are triangular, laminated, cylindrical, with clubbed or filiform extremities. They are the largest and most numerous in the duodenum and jejunum. In the upper part they are from 50 to 90 to the square inch, in the lower part from 40 to 70, their total number being about four millions.

They consist of a network of capillary and lacteal vessels inclosed in basement epithelium, covered by columnar epithelium.

Simple Follicles, or Crypts of Lieberkuhn, consist of minute depressions of the mucous membrane, opening by circular apertures, their surfaces are covered by capillary vessels. They may be found throughout the small intestine.

Bruner's, or the Duodenal Glands, are found in the duodenum and commencement of the jejunum. They are small, granular, flattened bodies imbedded in the submucous areolar tissue opening on the surface by minute ducts.

The Solitary glands are most numerous in the lower part of the Ileum, but are scattered throughout the entire extent of the small intestine in the mucous membrane. They are whitish bodies from one-half to a line in diameter, and contain a white secretion.

Peyer's Glands are aggregations of solitary glands, being 20 or 30 in a bunch in an oval or circular form.

The Large Intestine extends from the termination of the ileum to the anus, being some 5 feet long. It is largest at its commencement at the Caecum, gradually diminishing as far as the rectum, where it dilates just above the anus. It commences in the right iliac fossa. It is divided into the caecum, colon, and rectum. It is connected to the back part of the iliac fossa by the mesocaecum, which is formed by peritoneum.

Attached to its back part is the Appendix Vermiformis, a long, narrow, worm-shaped tube, its diameter about the size of a goose quill, and from three to six inches long. It has sometimes an incomplete valve at its opening into the caecum.

The Ileo-Caecal valve is formed by two layers of mucous membrane which project into the large intestine, and are separated from each other by a narrow elongated aperture.

The Colon is divided into four parts,—the ascending, transverse, descending, and the sigmoid flexure, the latter being its narrowest part.

The Rectum is the terminal part of the large intestine, extending from the sigmoid flexure to the anus, and from six to eight inches in length. In its middle portion it is adherent to the Vagina in the female. Its lower portion (about an inch) is surrounded by the internal sphincter, supported by the levatores ani muscles, and surrounded at its termination by the external sphincter. In the male it is separated from the bulb of the urethra by a triangular space, and in the female a similar space intervenes between it and the vagina. This space forms by its base the Perineum. The Rectum consists of four coats,—serous, muscular, cellular, and mucous. The latter presents for examination—epithelium, simple follicles, and solitary glands.

The Liver is the largest glandular body in the human system, weighing from three to

four pounds. It is situated in the right hypochondriac, extends across the epigastric into the left hypochondriac region. It has five lobes,—the lobus caudatus, lobus quadratus, lobulus spigelii, the right (the largest lobe), and the left lobe. It has five ligaments—the longitudinal, two lateral, coronary and round. It has five fissures—the longitudinal, fissure of the ductus venosus, transverse, fissure of the gall bladder, and fissure for the vena cava. Its function is to secrete bile, but it effects other important changes in certain conditions of the blood in its passage through the gland.

The Vessels of the Liver are five in number—the hepatic artery, portal vein, hepatic vein, hepatic duct, and lympathics.

The Nerves of the Liver are derived from the hepatic plexus of the sympathetic, from the pneumogastric nerves (especially the left), and from the right phrenic.

The Lobules form the chief mass of the hepatic substance. They are granular, glandular bodies, from 1-10 to 1-20 of an inch in diameter. They are composed of a plexus of biliary ducts, of a venous plexus (formed by branches of the hepatic vein), of a branch from the hepatic vein (intralobular), of minute arteries, and probably of nerves and lymphatics.

The Hepatic cells form the chief mass of each lobule, their form is irregulary round, their diameter being from 1-1000 to 1-2000 of an inch, and contains a nucleus (sometimes two) and a nucleolus. These cells are

probably the chief agents in the secretion of the bile.

The Lobular veins penetrate the lobule, the intralobular veins pass between the lobules, or through the lobules leaving it at its base to terminate in the sub-lobular veins which unite with neighboring branches to form larger veins, and these join to form the large hepatic trunks which terminate in the vena cava.

The Liver is inclosed in two investments—serous and fibrous. The former is derived from the peritoneum, the latter lies beneath it, is difficult of demonstration, and at the transverse fissure is continuous with the capsule of Glisson.

The Gall Bladder is the reservoir for the bile. It is a conical pear-shaped membranous sac, situated in a fossa on the under surface of the right lobe of the liver. It is about four inches in length, and an inch in diameter (in its largest part), holding from 8 to 10 drachms. It is divided into a neck, body, and fundus. The former is directed upward and backward; the latter is directed downward, forward, and to the right. It consists of serous, fibrous, muscular, and mucous coats.

The Biliary ducts are the hepatic, cystic, and the ductus communis choledochus. The latter is formed by the joining of the cystic duct and the hepatic duct, and is the common excretory duct of the liver and gall bladder, is the size of a goose quill, and about three inches long. It opens into the

descending portion of the duodenum a little below its middle.

The Pancreas is a conglomerate gland, its length is from 6 to 8 inches, its breadth is an inch and a half, its thickness is from a half to one inch; it is thickest at its right extremity and along its upper border. It is shaped something like a hammer, and described as a head, body, and tail. Its weight is from two ounces to eight. It is situated at the back part of the epigastric and both hypochondriac regions.

The Pancreatic duct extends transversely from left to right through the substance of the pancreas, commencing at the orifice, common to it, and the ductus communis choledochus. It gives off numerous branches which are distributed to its lobules. The secretion of the pancreas is almost identical with saliva.

The Arteries of the Pancreas are derived from the Splenic, and Pancreatico-duodenal branch of the Hepatic, and the Superior Mesenteric.

Its Veins open into the Splenic, and Superior Mesenteric veins. Its Lympathics terminate in the lumbar glands. It Nerves are filaments from the Splenic plexus.

The Spleen is a ductless gland, of oblong flattened form, soft, highly vascular, brittle, of a blueish-red color, situated in the left hypochondrium, embracing the cardiac end of the stomach, to which it is connected by the gastro-splenic omentum, the suspensory ligament connecting it to the diaphragm. Its weight is about seven ounces, its proportion

to the body's weight being 1 to 400, decreasing in age to 1 to 700. It enlarges after eating, is large in well fed, small in starved animals. It is invested by two coats—an external or serous, and an internal or fibrous elastic.

The former is derived from the peritoneum. The latter forms the framework of the spleen by its reflexion inward upon the vessels in the form of vagina or sheaths, from which—and from the inner surface of the fibro-elastic coat—numerous small fibres, or bands, are given off in all directions which freely unite, forming the areolar framework, the interspaces of which are occupied by the spleen substance proper, which consists of a dark, redish-brown colored mass, composed of colorless granular matter; nuclei about the size of red blood-disks, homogeneous or granular in structure, and nucleated vesicles in small numbers, and colored element consisting of red blood globules, and of colored corpuscles, either free or included in cells, and numerous deep red, or reddish yellow, or black corpuscles and crystals. They are similar to haematin.

The Malphigian Corpuscles are small semi-opaque round bodies, of gelatinous consistence, and are disseminated throughout its substance. They are more distinct in youth than age. They are formed of a membranous capsule formed by the pale fibres which interlace in all directions, formed by a prolongation from the sheaths of the small arteries to which the corpuscles are attached.

Each capsule contains a soft, white, semi-fluid substance, consisting of granular matter, nuclei similar to those found in the pulp, the latter being albuminous.

The Splenic Artery is remarkable for its large size and tortuosity, dividing into from four to six branches, it enters the spleen at the hilus, and ramifies throughout its substance, each branch running transversely, giving off numerous branches until they terminate in tufts, a capillary network which lie in contact with the pulp.

The Veins are large, and more numerous than the arteries; their union forms five or six veins which, uniting at the hilus, forms the splenic vein—the largest branch of the venæ porta.

The Lymphatics are deep and superficial; they terminate in the thorasic duct.

The Nerves are derived from the branches of the right and left semilunar ganglia, and the right pneumogastric nerve.

The Thorax is an osseous framework whose object is the protection of the heart, and the lungs. It is bounded in front by the ribs and sternum, behind by the ribs and spinal column, on each side by the ribs, below by the upper surface of the diaphragm, above it is constricted—limited by the first rib, on a line with the first dorsal vertebra.

The Pericardium is the membranous, conical sac, in which the heart, and commencement of the great vessels is contained. It is situated behind the sternum, and the cartilages of the fourth, fifth, sixth and seventh

ribs on the left side. Its apex is directed upward; its base is attached to the diaphragm. It consists of a fibrous and serous coat. The latter has a smooth inner surface, and secretes a thin fluid that serves to facilitate the movements of the contained organ. Its arteries are derived from the internal mammary—the bronchial, oesophageal, and phrenic.

The Heart is a hollow muscular organ, conical shape, situated between the lungs, its base is directed upward and backward to the right, the apex is directed downward, forward and to the left. The heart projects about three inches to the left and an inch to the right of the median line; its upper border is as high as the upper part of the third costal cartilages; its lower border as low as the lower border of the gladiolus. Its posterior surface rests on the diaphragm. It measures in the adult five inches in length, three and one-half inches in breadth, at its broadest part. Its proportion to the weight of the body is 1 to 169 in males, and 1 to 149 in females. The heart contains four cavities—two above, side by side; the auricles, right and left, from their position; and two cavities below, the right and left ventricles.

The Heart is the hydraulic pump that forces the blood throughout the entire body, the Circulation being effected by the venous blood entering the right auricle by the Superior and Inferior venæ cava, and the Coronary sinus. From the right auricle the blood passes into the right ventricle, and from the right ventricle, through the Pulmonary ar-

tery, into the lungs. The blood arteralized by its passage through the lungs, is returned to the left auricle by the Pulmonary veins. From the left auricle the blood passes into the left ventricle, and from the left ventricle the blood is distributed by its contraction, through the Aorta, and its subdivisions throughout the entire body.

The right Auricle, a little larger than the left, holds some two ounces. The Appendix auricular is a small pouch at its upper portion. The objects of interest are—the Eustachian, and Coronary valves, the annulus ovalis, and fossa ovals relics of foetal structure, and the openings, which are the Superior venæ cava, Inferior vena cava, Coronary sinus, Foramina Thebesii, and Auriculo-ventricular.

The Superior Venæ Cava returns the blood from the upper half of the body; the Inferior Vena Cava returns the blood from the lower half of the body.

The Coronary sinus returns the blood from the substance of the heart, finding an opening between the Superior and Inferior vena cava.

The Foramina Thebesii are the opening of small veins returning the blood from the muscular substance of the heart.

The Eustachian valve is the valve of the inferior vena cava; in the foetus it is very large; in the adult it is small and sometimes absent.

The Coronary valve, at the orfice of the Coronary sinus, prevents the regurgitation of

blood into the sinus. It is sometimes double.

The musculi pectinati are small, prominent, muscular columns which run across the inner surface of the appendix auricular.

The right Ventricle holds about three fluid ounces; its walls are only half as thick as the left. It has two openings—the auriculo-ventricular (between the auricle and ventricle), and the opening for the pulmonary artery; and two valves—the tricuspid, and semilunar.

The Semilunar valve guards the opening of the Pulmonary artery.

The Tricuspid valve consists of three segments of a triangular shape. Its free margin and ventricular surface affords attachment to a number of delicate and tendenous chords, the chordæ tendineæ. It guards the auriculo-ventricular opening. Behind each valve is a sinus of Valsalva, which are pouch-like dilitations.

The left Auricle is thicker and smaller than the right, and consists of a principal cavity and an appendix auriculæ. The latter is of cuboidal form. It is somewhat constricted at its connection with the auricle, and is a simple dilitation. It contains the openings of the four pulmonary veins, and the auriculo-ventricular opening. The former open, two on each side of the auricle, and have no valves. The latter is a large oval aperture. The musculi pectinati are few in number.

The left Ventricle is longer and more cone-like than the right ventricle, forming

the apex of the heart by its projection beyond the right ventricle. Its walls are twice as thick as those of the right ventricle. Its openings are the auriculo-ventricular, and aortic. The latter is a small circular opening, in front and to the right side of the auriculo-ventricular, from which it is separated by one of the segments of the mitral valve. Its orifice is guarded by the semilunar valves, which are very thick and strong.

The Mitral valve guards the ariculo-ventricular orifice: It is stronger than the tricuspid.

The Columnæ Corneæ are small, rounded, muscular eminences, which project from nearly every part of the inner surface of the ventricle.

The Endocardium is the serous membrane which lines the internal surface of the heart. By its reduplication it assists in forming the valves of the heart, and is continuous with the lining membrane of the great blood vessels. It is thickest in the left auricle.

The Heart is composed of muscular fibres, connected to fibrous rings. The latter surround the arterial orifices, and the auriculo-ventricular opening. They are strongest on the left side.

The Muscular Fibres of the Heart are of a deep-red color, marked with transverse striæ, and are intricately interlaced; those of the auricules, and ventricles, are quite distinct and independent. Those of the auricles are arranged into a superficial and deep layer; the former common to both cavi-

ties, the latter limited to one. Fibres of the ventricles are arranged so that some fibres are common to both cavities, others exclusively for one.

Arteries of the Heart are the anterior and posterior coronary, veins accompanying them terminate in the right auricle by the great cardiac vein, the small or anterior cardiac veins, and the venae cordis minimae.

The Lympathics terminate in the thoracic and right lympathic ducts. Its Nerves are derived from the cardiac plexuses, which are formed from both the spinal and sympathetic system, and are distributed in great abundance.

The chief peculiarities in the fœtal heart is the communication between the two auricles by the foramen ovale, and the large size of the eustachian valve. In the second month the fœtal heart is at 1 to 50 in weight, at birth 1 to 120.

The peculiarity in the arterial system of the foetus is the communication of the pulmonary artery and the descending aorta, by means of the ductus arteriosus; and the communication between the internal iliac arteries and the placenta, by the umbilical arteries.

The Umbilical arteries arise from the internal iliacs, in addition to those branches given off in the adult. They return the blood to the placenta which has been circulated through the foetal system.

Peculiarity in the foetal venous system is the communication established between the

placenta, and liver, and portal vein, through the umbilical vein, and with the inferior vena cava by the ductus venosus.

Foetal Circulation.—Blood destined for its nutrition is carried from the placenta to it by the umbilical vein, entering the body at the umbilicus, passing to the liver it gives off several branches. In the inferior vena cava, the blood carried by the ductus venosus and hepatic veins becomes mixed with that returning from the lower extremities, and viscera of the abdomen. The head and upper extremities receive the greater amount of blood, but little going to the lower part of the body. The lungs being quite solid they receive little blood.

The Placenta is a respiratory and nutrative organ. A double current meets in the right auricle. The blood in the inferior vena cava being guided by the eustachian valve into the left auricle, whilst that in the superior vena cava descends into the right ventricle.

At birth, when respiration is established, an increased amount of blood passes through the lungs, which now perform their office as respiratory organs, and at the same time the placental circulation is cut off. The foramen ovale becomes closed about the tenth day.

The Ductus Arteriosus begins to contract immediately after respiration is established, and becomes completely closed by the fourth to the tenth day. The portion of the umbilical artery continued on to the bladder from the trunk of the corresponding internal iliac,

remains pervious, as the superior vesicle artery. The part between the bladder and umbilicus become obliterated from the second to the fifth day. The umbilical vein and ductus venosus become completely obliterated by the second to the fifth day.

The Larynx is the organ of voice, situated at the upper part of the air passage, between the base of the tongue and the trachea. It is narrow and cylindrical below, broad and triangular above. It is composed of cartilages, connected by ligaments, moved by numerous muscles, and lined by mucous membrane. Its Cartilages are the Thyroid, Cricoid, Epiglottis, 2 Arytenoid, 2 Cornicula laryngis, and 2 Cuneiform.

The Thyroid is the largest, consisting of two lamella uniting at an acute angle in front, forming a verticle projection in the middle line, which is prominent above and called the Pomum Adami (Adam's apple.)

The Cricoid, small but thick, forms the lower and back part of the organ.

The Arytenoid are situated at the back of the larynx, at the upper border of the Cricoid.

The Epiglottis, a thin lamella of yellowish fibro-cartilage, leaf shaped, placed behind the tongue, in front of the superior opening of the larynx, which it closes over during deglutition.

The Hyo-epiglottic ligament connects it to the hyoid bone.

The Ligaments of the Larynx are three extrinsic, connecting the cartilages with other organs, and sixteen intrinsic, or those

connecting the cartilages with each other.

The superior aperture of the larynx is triangular, its base anterior.

The Glottis, or Rima Glottidis, is the interval between the inferior vocal cords; the superior or false vocal cords are placed above the latter. They consist almost entirely of a folding inward of mucous membrane, inclosing a delicate narrow fibrous band the superior thyro-arytenoid ligament. This ligament consists of a thin band of elastic tissue, attached to the angle of the thyroid cartilage below the epiglottis anteriorly, and behind to the anterior surface of the arytenoid cartilage (one on each side.) The true vocal cords are two inferior thyro-arytenoid ligaments, covered externally with a thin layer of mucous membrane. Each ligament consists of a band of yellow elastic tissue, attached in front to a depression between the two alae of the thyroid cartilage, and behind to the base of the anterior angle of the base of the arytenoid.

The Ventricle of the Larynx is an oblong fossa situated between the superior, and inferior vocal cords.

The Sacculus Laryngeous, or the Laryngeal Pouch, is situated between the Superior vocal cord and the inner surface of the thyroid cartilage.

Muscles of the Larynx are the Crico-thyroid, Crico-arytænoideus posticus and lateralis, Arytænoideus, Thyro-arytænoideus.

Muscles of the Epiglottis are the Thyro-epiglottideus, and the Arytæno-epiglottideus superior, and inferior.

The mucous membrane of the Larynx is continuous above, with that lining the mouth and pharynx, and is prolonged through the trachea and bronchi into the lungs.

Glands of the Larynx are muciparius, very numerous, excepting the vocal cords, which have none. Its blood vessels are the laryngeal, derived from the superior and inferior thyroid.

The Veins empty themselves in the superior, middle, and inferior thyroid. Its Lymphatics terminate in the deep cervical glands. Its Nerves are the superior laryngeal, the inferior or recurrent laryngeal branches of the pneumogastric, joined by filaments from the sympathetic.

The Trachea, or air tube, is cartilaginous and cylindrical, extending from the lower part of the larynx, opposite to the third dorsal vertebra, where it divides into two bronchi—one for each lung. It is 4½ inches in length, from ¾ to an inch in diameter, and is anterior to the œsophagus.

The right Bronchi, shorter, thicker, and more horizontal than the left, about an inch long, enters the right lung opposite the fourth dorsal vertebra.

The left Bronchus, smaller, more oblique, and two inches long, enters the left lung opposite the fifth dorsal vertebra. (Bronchi are described with the lungs.)

The Trachea is composed of imperfect cartilaginous rings, fibrous membrane, muscular fibres, longitudinal yellow elastic fibres, mucous membrane and glands. The trachea

proper is composed of fibrous membrane, the tube being surrounded in part of its diameter by cartilaginous rings, situated a little distance apart.

The first cartilage is the broadest, and is connected by one end to the cricoid cartilage by fibrous membrane.

Glands are freely distributed over its anterior part. They are small, flat, ovoid bodies placed between the fibrous, and muscular coats, each having a duct which opens on the surface of the mucous membrane.

The Inferior Thyroid Arteries supply the trachea, the Veins terminating in the thyroid venous plexus, the Nerves are derived from the pneumogastric and its recurrent branches, and from the sympathetic.

The Pleura is a very delicate, serous membrane that surrounds each lung, as far as its root, and is then reflected upon the inner surface of the thorax. That surrounding the lung is the Pleura Pulmonalis, that which lines the inner surface of the chest, is called the Pleura Costalis, the space between the two is called the Cavity of the Pleura.

The Mediastinum is the space left by the non-approximation of the two pleuræ. It is divided into the anterior, middle, and poster mediastinum. The middle mediastinum is the broadest, containing the heart inclosed in the Pericardium, ascending Aorta, superior vena cava, bifurcation of the Trachea, Pulmonary arteries and veins, and the Phrenic nerves.

The right Pleura is shorter, wider, and reaches higher in the neck, than the left.

Arteries of the Pleura are derived from the intercostal, the internal mammary, phrenic, inferior thyroid, thymic, pericardiac, and bronchial. The Veins correspond to the arteries. Lymphatics are very numerous.

The Lungs, the essential organs of respiration, are two in number, placed one in each of the lateral cavities of the chest. Each lung is conical in shape, and presents for examination an apex, base, two borders and two surfaces.

The Apex forms a tapering cone which projects an inch or an inch and a half above the level of the first rib. Its base, broad and concave, rests upon the diaphragm. The external or thoracic surface is smooth, convex, and corresponds to the form of the cavity of the chest. The inner surface is concave. In front is a deep depression for the convex surface of the pericardium, behind is a deep fissure (the hilum pulmonis), which gives attachment to the root of the lung.

The right Lung is the shortest, (by an inch,) broadest, heaviest, (by two ounces,) and has three lobes.

The left is the longest, lightest, smallest, and has two lobes.

The root of each lung is situated a little above its middle, and is formed by the bronchial tube, pulmonary artery, pulmonary veins, bronchial arteries and veins, pulmonary plexus of nerves, lymphatics, bronchial glands, and areolar tissue, all of which are enclosed by a reflexion of the pleura.

The weight of the two lungs is about 42

ounces, their proportion in the male being as 1 to 37, in the female 1 to 43.

Their color in youth is pinkish-white, becoming dark as age advances, of spongy, light, texture, it crepetates when handled owing to the air in its interior.

The lungs are composed of an external serous coat, a sub-serous areolar tissue, and the pulmonary tissue or parenchyma. The latter is composed of lobules which, although closely connected together by an interlobular areolar tissue, are quite distinct from one another.

The Lobules on the surface are large, of a pyramidal form, the base is turned toward the surface, those in the interior are smaller, and of various forms. Each lobule is composed of one of the ramifications of the bronchial tube and its terminal air cell, of the ramifications of the pulmonary and bronchial vessels, lymphatics, and nerves,—all of these structures connected by areolar fibrous tissue.

The divisions of the bronchus are dichotomous. The cartilages are continued on the sub-divisions of the tubes until they gain the diameter of one-fourth of a line. The fibrous coat, and longitudinal elastic fibres are continued into the smallest ramifications of the bronchi. The mucous membrane is covered with columnar, ciliated epithelium.

The air cells are small, polyhedral, alveolar recesses, varying from 1-200 to 1-70 of an inch in diameter, and are the largest on the surface, at the thin borders and at the apex, and smallest in the interior. In the smallest

diameter of the bronchial tubes they loose their characteristics, and continue on as tubes composed of longitudinal elastic, and fibrous tissue, the muscular fibres disappear, and the mucous membrane becomes thin, delicate and lined with a layer of squamous epithelium.

The Pulmonary artery conveys the venous blood to the lungs, its branches accompany the bronchial tubes, and terminate in a capillary network upon the walls of the intercellular passages, and air cells. From this network the radicles of the pulmonary veins arise, which, coalescing, accompany the arteries, and return the blood purified by its passage through the capillaries, to the left auricle of the heart.

The Bronchial arteries supply the blood for the nutrition of the lung. They are derived from the thoracic aorta, and terminate in the pulmonary and bronchial veins. The latter terminate in the vena azygos on the right side, in the superior intercostal vein on the left side.

The Lymphatics, a deep and superficial set, terminate in the bronchial glands.

Their Nerves are from the anterior, and posterior pulmonary plexuses, formed chiefly by branches from the sympathetic, and pneumogastric. They are lost upon the bronchial tubes.

The Thyroid Gland has no duct; its function is unknown; it consists of two lateral lobes, one on each side of the upper part of the trachea, connected together by a narrow transverse portion—the Isthmus.

It is brownish-red, weighs from 1 to 2 ounces, largest in females, enlarging during menstration, (its hypertrophy is called goitre,) each lobe is cone-shaped, and consists of numerous minute, closed vesicles, composed of a homogeneous membrane, inclosed in a dense capillary plexus. The vessels are spherical or oblong, containing a yellowish fluid.

Its Arteries are the superior, and inferior thyroid,—occasionally a branch from the arteria innominate. They frequently anastomose, and are of large size. The Veins form a plexus on the surface of the gland and front of the trachea, from which arise the superior, inferior, and middle thyroid veins.

The Lymphatics are numerous, large, terminating in the thoraic, and right lymphatic ducts.

The Thymus Gland has no excretory duct, attaining its full size the second year, it then dwindles, and at puberty has nearly disappeared. It extends from the lower border of the thyroid gland, to the fourth costal cartilage, and rests on the pericardium. It weighs about an ounce and a half, and contains a fluid resembling chyle. Its Arteries are from the internal mammary, and the superior and inferior thyroid, its Veins terminating in the thyroid veins, and left venæ innominate,—the Lymphatics in the Internal Jugular vein. Its Nerves are from the pneumogastric and sympathetic.

The Kidneys are two glandular organs, intended for the secretion of the urine. They are situated one in each lumbar region,

behind the peritoneum, extending from the eleventh rib, to near the crest of the Ilium, the right being a little the lowest.

The anterior surface of the kidney is convex, partially covered by the peritoneum, and is in relation on the right side with the back part of the right lobe of the liver, the descending portion of the duodenum, and ascending colon;—on the left side with the great end of the stomach, the lower end of the spleen, the tail of the pancreas, and descending colon.

The internal border is concave, and presents a deep notch, the Hilus, more marked behind than in front. At the Hilus, the vessels, excretory duct, and nerves pass into or from the organ,—the branches of the renal vein in front, the artery and its branches next, the excretory duct or ureter, being behind and below. The Sinus occupies the inside of the kidney.

Each kidney is about four inches in length, two in breadth, and one in thickness, the left one a little the longest and thinest. Each weighs (in the adult) about 4½ or 6 ounces, in the female 4 to 5½ ounces.

They are enclosed in a dense fibro-areolar tissue, and have an external or cortical, and an internal or medullary substance. The former forms ¾ of the gland, and forms a layer. It is soft, reddish, granular, and contains the Malpighian bodies, and is formed of convoluted tubuli, uriniferi, blood vessels, lymphatics, and nerves, connected together

by a firm transparent granular substance, which contains small granular cells.

The Medullary substance consists of pale, reddish-colored, conical masses, the pyramids of Malpighi, in number from 8 to 20, their bases tord the circumference, their apices converge tord the sinus, and terminate in rounded extremities called the papilla.

The Medullary substance presents a striated appearance from being composed of a number of minute diverging tubes named the Tubuli Uriniferi. They commence at the apices of the cones by small orifices from 1-300 to 1-200 of an inch, from whence they pursue a diverging course, frequently dividing until they reach the cortical substance, then becoming convoluted, they anastomose with each other frequently, maintaining the same diameter. The number of orifices on each papillæ is estimated at a thousand. The tubuli are formed of a transparent, homogeneous, basement epithelium, lined by sphenoidal epithelium.

The Malpighian bodies, confined to the cortical substance, are small, deep-red, round bodies, averaging 1-120 of an inch in diameter. Each consists of a vascular tuft, enclosed in a thin membranous capsule. These are called the afferent vessels; they pierce the capsule, forming a finer set of capillaries, these uniting in larger veins are called the Efferent.

The Ureter is the duct of the kidney. As it approaches the hilus it is dilated, and called the pelvis. It enters the sinus, and

subdivides into three prolongations—the infundibula,—one at each extremity and one in the middle of the organ. These subdivide into from 7 to 13 smaller tubes—the calices, each by a cup-shaped pouch embraces the base of one of the papillæ, and catches the urine.

The Renal Artery, large in proportion to the size of the gland, supplies the kidney. Dividing into four or five branches it enters the kidney at the hilus. Its one single vein opens into the inferior vena cava; its lymphatics in the lumbar glands.

Nerves of the kidney are derived from the renal plexus, which is formed by filaments of the solar plexus, and lesser splanchnic nerves.

The Ureter is the excretory duct of the kidney, a cylindrical membranous tube, 18 inches long, opening into the base of the bladder after passing for nearly an inch between its muscular and mucous coats. It is composed of a serous, muscular, and mucous coat. Its Arteries are the Renal, Spermatic, Internal Iliac, and Inferior Vesicle. Its Nerves are from the Inferior Mesenteric, Spermatic, and Hypogastric plexus.

The Supra Renal capsules are ductless glands, situated one on each kidney, in front of its upper end. They measure from an inch and a quarter to two inches in length, from two to three lines in thickness, and from one to two drachms in weight. Its Arteries are from the aorta, phrenic, and renal. Previous to their entering the gland they freely subdivide. The Lymphatics terminate in the

lumbar glands. Its Nerves are from the solar and renal plexuses, and the phrenic, and pneumogastric.

The Pelvic cavity is that part of the general abdominal cavity which is below the level of the linea ilio-pectinea, and the promontory of the sacrum, bounded behind by the sacrum, coccyx, and the great sacro-sciatic ligaments, in front and at the sides by the pubis and ischia, above it communicates with the cavity of the abdomen, limited below by the levatores ani and coccygei muscles, and the visceral layer of the pelvic fascia, which is reflected on to the viscera from the pelvic walls.

The Viscera in this cavity are the urinary bladder, lower end of the rectum, and some of the generative organs peculiar to each sex.

The Bladder is the reservoir for the urine. It is a musculo-membranous sac, consisting of a serous, muscular, cellular, and mucous coat, containing about a pint when moderately distended, and measuring about five inches in length, and three in breadth. It is largest in the female, and situated in the pelvis, behind the pubis;—in front of the rectum in the male, the uterus and vagina intervening in the female, its shape, position, and size, are influenced by age, sex, and distention. In infancy it is conical; in adult life it is triangular. It is divided into a summit, body, base, and neck. The base is directed downward and backward.

The cervix, or neck, is the constricted portion of the bladder continuous with the

urethra. In the male its position is oblique in the erect posture, and surrounded by the prostate gland. In the female its direction is obliquely downward and forward. It is retained in its place by ligaments, which are divided into true and false. The former are two lateral, two anterior, and the urachus, which connects its summit to the umbilicus. The latter are five in number.

Arteries of the bladder are the superior, inferior, and middle vesical, with the addition of the uterine in the female.

The veins form a complicated plexus around the neck, sides and base of the bladder, terminating in the internal iliac veins.

Lymphatics accompany the blood vessels.

The Nerves are from the hypogastric and sacral plexuses, the former supplying the upper, the latter its lower part.

The Urethra extends from the neck of the bladder to the meatus urinarius. In the male, in the erect position it is shaped something like a syphon, presenting a double curve in its placid state. It is divided into a prostatic, membranous, and spongy portion, and is from 8 to 9 inches in length.

The Prostatic portion is the widest, and most dilatable part, is an inch and a quarter in length, and passes through the prostate gland, the latter opening on the bottom of its interior by numerous orifices in the floor of the prostatic sinus.

The Vesicula Prostatica in the middle line, gives entrance to the ejaculatory ducts, through slit-like openings.

The membranous portion of the urethra extends between the apex of the prostate, and the bulb of the corpus spongiosum. It is separated from the rectum by the perineum, is surrounded by the compressor urethra muscle, it is about five-eights of an inch long.

The spongy portion is contained in the corpus spongiosum, it is about 6 inches long, terminating in the meatus urinarius, the latter being the narrowest part of the urethra, and is a vertical slit about three lines long. It has two dilations, within the glans penis forming the fossa navicularis, and near its commencement, forming the bulb, into the latter open the ducts of Cowper's glands.

The Urethra has three coats—mucous, muscular, and erectile. A thin layer of erectile tissue is continued from the corpus spongiosum around the membranous and prostatic portions of the urethra to the neck of the bladder.

The Prostate Gland is a pale, firm, glandular body, which surrounds the neck of the bladder, and commencement of the urethra. It lies upon the rectum, to which it is connected by a dense areolar fibrous tissue. It measures about an inch and a half in its transvere diameter and consists of three lobes. It is perforated by the urethra, and the common seminal ducts.

The ejaculatory ducts pass forward obliquely, through a conical canal situated in the lower part of the prostate and opens into the prostatic portion of the urethra.

The Gland consists of a glandular substance, and muscular tissue, enclosed in a thin but firm capsule.

The muscular tissue is arranged in circular bands around the urethra.

The Glandular substance is composed of numerous follicular pouches, opening into elongated canals which join to form from 12 to 20 small excretory ducts.

The Follicles are enclosed in a delicate capillary plexus.

The Epithelium lining the canal is columnar, that in the terminal vesicles is squamous.

The Arteries are from the internal pudic, vesical, and hæmorrhoidal.

The Veins form a plexus around the sides and base of the gland, they communicate in front with the dorsal vein of the penis, and terminate in the internal iliac.

The Nerves are from the hygogastric plexus.

The Prostatic secretion is a milky fluid having an acid reaction, and containing molecular matter, and granular nuclei. It is subject to enlargement in age.

Cowper's Glands are two small, round, lobulated bodies of a yellowish color, about the size of a pea, and placed beneath the fore part of the membranous portion of the urethra. Each gland consists of several lobules, held together by a fibrous investment. Each gland opens by an excretory duct, nearly an inch long, and opens on the bulbous portion of the urethra.

The Penis is the male organ of copulation, and consists of a root, body, and a glans penis. The root is broad and connected to the ramus of the pubes by two strong, tapering processes—the crura, and in front to the symphysis pubis by a fibrous membrane—the suspensory ligament.

The Glans Penis is bluntly cone-shaped, flattened from above downward. At its summit is a vertical fissure—the meatus urinarius. The base of the glans presents a projecting border—the Corona Glandis,—and behind this a deep constriction—the Cervix. These parts are covered by the glandulae Tysonii.

The body placed between the root and the glans penis is cylindrical when flacid, somewhat triangular when erect, the broadest side turned upward. Its integument is remarkable for its thinness, looseness, and dark color. It contains no adipose tissue. The prepuce is a fold of loose unconnected skin which surrounds the glans penis. The mucous membrane of the glans penis is covered with minute, highly sensative papilla.

The Penis is composed of a mass of erectile tissue enclosed in three cylindrical fibrous compartments. Two of these, the corpora cavernosa, are placed side by side; the third, or corpus spongiosum, includes the urethra. The two former consist of a strong fibrous membrane enclosing a fibrous rectular substance containing erectile tissue in its meshes. Each is separated from its fellow by an incomplete fibrous septum. The corpus spongiosum is situated below the corpus cavernosa, its

expansion forms the glans penis. The bulb is surrounded by a fibrous investment, surrounded also by the accelerator urinae muscle. The erectile tissue consists of a network of veins lodged in the interspaces between the trabeculæ. Their walls are very thin and lined by squamous epithelium. They return the blood by a series of vessels some of which emerge in considerable numbers from the glans penis, and converge on the dorsum to form the dorsal vein. Others pass out on the substance of the corpus cavernosa, and reveiving branches from the corpus spongiosum, wind around the sides of the penis to form the dorsal vein, but the greater number pass out at the root of the penis and join the prostatic plexus and pudendal veins.

Arteries of the penis are from the internal pudic. Those supplying the corpus cavernosa are the arteries of the corpus cavernosa and branches of the dorsal artery of the penis. Those of the corpus spongiosum are the arteries or the bulb. The lymphatics join the deep lymphatics of the pelvis. The nerves are derived from the internal pudic and the hypogastric plexus.

The Testes are two glandular bodies which secrete the semen and are suspended in the scrotum by the spermatic cords. They are covered by the skin and dartus which constitute the scrotum—intercolumnar or external spermatic fascia, cremaster muscle, infundibuliform fascia (fascia propra, or internal spermatic fascia) and tunica vaginalis. Each gland is about an inch in breadth, one and

one-half to two inches long and weighing from six to eight drachms. Attached to its upper and posterior part is the Epididymis, with an upper enlarged part called the head and a small terminal body the tail.

The Scrotum is a cutaneous pouch in which the testes hang. The testes proper are covered by the tunica vaginalis, tunica albuginea and tunica vasculosa. The glandular structure of the testes consist of numerous lobules—about 300. Those occupying the middle situation are larger and longer than those lying externally. Their bases are directed outward, their length—unraveled—is about two feet, their diameter 1-200 to 1-150 of an inch. They consist of a basement membrane, lined by epithelium, consisting of nucleated and granulated corpuscles, and are enclosed in a delicate plexus of capilary blood vessels. They terminate in from twelve to twenty ducts—the vassa efferentia, they carry the seminal fluid to the epididymis from the testes, and form the globus major of the epididymis by their convultions.

The Vas deferens, the excretory duct of the testes, is the continuation of epididymis. Commencing at the lower part of the globus minor it ascends along the spermatic cord, and reaching the vesicula seminalis it becomes enlarged, it becomes contracted at the prostate. It unites with the duct of the vesiculæ seminales to form the ejaculatory duct. The vas deferens is about two feet in length, is hard and cordy, a line and a quarter in diameter, and cylindrical. The walls are very heavy. It consists of

three coats—cellular, muscular and mucous. The spermatic cord extends from the internal abdominal ring, where the structures of which it is composed converge, to the posterior part of the testicle. It is composed of arteries, veins, lymphatics, nerves, the excretory duct of the testicle and connected together by areolar tissue, and invested in its proper coverings. The left cord is a little longer than the right.

Its arteries are the spermatic—from the aorta, the artery of the vas deferens—from the superior vessicle, and the cremasteric—from the epigastric artery. The spermatic supplies the testicle. The cremasteric supplies the cremaster muscle and other coverings of the cord. The Spermatic veins empty into the inferior vena cava. The Lymphatics of large size terminate in the lumbar glands. The Nerves are the spermatic plexus from the sympathetic, this plexus is derived from the renal and aortic plexuses, joined by filaments from the hypogastric plexus, which accompany the artery of the vas deferense.

The Vesiculæ Seminales are two lobulated membranous pouches, placed between the base of the bladder and rectum, serving as reservoirs of the semen, and secreting some fluid to be added to that of the testicles. They measure about two and one-half inches in length, and five lines in thickness. Their upper surface is in contact with the base of the bladder, extending from near the termination of the ureters to the base of the prostate gland. Each vesiculæ consists of a single

tube coiled upon itself, some six inches long (when uncoiled), the diameter of a goose-quill, becoming constricted at its anterior extremity it joins with the corresponding vas deferens to form the ejaculatory duct. They consist of three layers—fibro-cellular, fibrous, and mucous, and lined with squamous epithelium.

The Arteries supplying the vesiculae seminales are derived from the internal vesicle, and middle haemorrhoidal. The Veins and Lymphatics accompany the arteries. The Nerves are derived from the Hypogastric plexus. The Seminal fluid is thick, whitish, albuminous, containing seminal granules 1-4000 of an inch in diameter, and the Spermatazoa, the latter are the essential organs in producing fecundation, and are remarkable for their constant lashing motion.

The Testes, at an early period of life foetal, are placed at the back part of the abdominal cavity, behind the peritoneum, in front of, and a little below, the kidneys.

The Gubernaculum testis is a conical-shaped cord attached above to the lower end of the epididymis, below to the bottom of the scrotum, attaining its full development from the fifth to the sixth month, completely filling the inguinal canal.

From the fifth to the sixth month the testes descend to the iliac fossa, the gubernaculum at the same time becoming shortened. During the seventh month they enter the abdominal ring, the processus vaginalis preceeding the testes in its course through the canal. In the eighth month they descend into the scrotum.

The Tunica vaginalis is formed by the upper part of the pouch of the peritoneum closing above the testicle. The Gubernaculum is the principal agent in producing the descent. Its analogy in the female is the round ligament of the uterus.

The external organs of generation in the female are the mons veneris, labia majora, labia minora, clitoris, meatus urinarius, and the vaginal orifice. These parts are all included in the name Vulva, or Pudendum.

The Mons Veneris is a rounded eminence in front of the pubes, above the vulva, formed by a mass of fatty tissue, beneath the integument. At puberty it is covered with hair.

The Labia Majora are two prominent longitudinal, cutaneous folds, lined with mucous membrane, extending downward from the mons veneris to the anterior boundary of the perineum, enclosing the urino-sexual opening. At their posterior commissure is situated the Fourchette, consisting of a small fold, the space between it and the commissure is called the fossa navicularis.

The Labia Minora, or Nymphae, are two folds of mucous membrane, situated within the labia majora, extending from the clitoris about an inch and a half on each side of the orifice of the vagina, and are lost upon its surface. They are provided with numerous crypts which secrete an abundance of sebaceous matter.

The Clitoris, the analogy of the corpora cavernosa of the male, is situated in the an-

terior commissure of the labia minora, its glans clitoridis being external, its body concealed beneath the labia. It is highly sensative and erectile.

The space between the clitoris and the opening of the vagina is termed the vestibule. At the back part of the vestibule is situated the meatus urinarius, surrounded by a prominent elevation of the mucous membrane.

Below this is the Hymen, consisting of a fold of mucous membrane, stretched like a curtain across the orifice of the vagina, having a circular opening, resembling the iris and pupil. It is not always present in the virgin, and its absence is not absolute proof of previous copulation.

The glands of Bartholine are situated on each side of the commencement of the vagina. They open externally to the hymen by a duct, and are the analogy of Cowper's gland in the male.

The Bulbi Vestibuli, the analogy of the male bulb of the corpus spongiosum, are two rounded bodies about an inch in length—oblong—situated one on each side of the vestibule, surrounded by a plexus of veins.

The urethra, in the female, is a narrow membranous canal about an inch and a half in length, which leads from the neck of the bladder to the meatus urinarius. Its undilated diameter is about a quarter of an inch. It is surrounded by muscular fibres of the compressor urethra muscle, and perforates the triangular ligament as in the male. It consists of a muscular, erectile, and mucous coat.

It is capable of greater dilation than that of the male. The female rectum is less curved and more spacious than the male.

The Vagina is a membranous canal leading from the vulva of the uterus. It is situated in the cavity of the pelvis, behind the bladder and in front of the rectum. Its axis is curved forward and downward. Its walls, in contact with each other, are cylindrical when distended. Its length is about four inches along its anterior wall, six inches along its posterior wall. It surrounds the vaginal portion of the servex uteri.

The Vagina consists of three coats—muscular, erectile tissue, and mucous. The latter is covered with mucous glands and follicles, and is continuous with that lining the uterus, and below with the integument covering the labia majora. Rugæ are well marked along its surface.

The Uterus is the organ of gestation, receiving the fecundated ovum in its cavity, retaining and supporting it during the development of the foetus, and is the principal agent in its expulsion at the time of parturition.

In the virgin it is pear-shaped, situated between the rectum and bladder, retained in its position by the round and broad ligaments on each side, measures about three inches in length, two in breadth, weighing from one to one and a half ounces. It is divided into a fundus, body and neck.

The former is the upper, broad, portion. The latter the lower constricted portion (ex-

tending into the upper part of the vagina.) The body is the part between the two extremes; it narrows from above downward.

The Os uteri is its vaginal opening, bounded by two lips—an anterior and posterior; the former thick, the latter narrow and long.

Ligaments of the uterus are two anterior, two posterior, and two lateral, each formed by peritoneum. It has three coats—serous, muscular, and mucous, the middle layer forming its chief bulk; its fibres are unstriped.

The cavity of the uterus is small, surrounded by columar ciliated epithelium.

The Arteries of the uterus are the Uterine (from the Iliac) and the Ovarian (from the Aorta.) They are large, tortuous, and freely anastomose. The Veins are large and correspond with the arteries, and terminate in the uterine plexuses. The Lymphatics of large size terminate in the pelvic and lumbar glands. The Nerves are derived from the inferior hypogastric, and spermatic plexuses, and from the third and fourth Sacral nerves.

Its appendages are the fallopian tubes, the ovaries and their ligaments, and the round ligaments. These, enclosed between two folds of peritoneum, constitute the broad ligaments.

The Fallopian tubes convey the ova, from the ovaries to the cavity of the uterus. Each tube is four inches in length, its diameter the size of a bristle. It enters the upper part of

the uterus by the ostium internum. Its upper end—Fimbriated—embraces the ovary during sexual excitement. The fallopian tube has three coats—serous, muscular, and mucous, the latter covered with columnar ciliated epithelium.

The Ovaries are analagous to the testes of the male, of oval shape, one in each broad ligament on each side of the uterus, of a whitish color, an inch and a half in length, three-fourths of an inch in thickuess, weighing from one to two drachms. Their proper covering is the tunica albuginea. The gland is soft, abundantly supplied with blood vessels,—numerous, small, transparent, round vesicles, in various stages of development; they are the Graafian vesicles, the ovisacs containing the ova. They vary from 15 to 20 in women who have not borne children. They are deeply seated, and when mature form projections on the surface of the ovary. The Ovi capsule is the internal coat of the ovary, and it is lined by a layer of nucleated cells, called the membrana granulosa.

The Ovum is a small, spherical, body, situated in the immature vesicles, near their center, but in the mature ones it is in contact with the membrana granulosa.

The Ovum is from 1-240 to 1-200 of an inch in diameter; it has a covering—the vitelline membrane, within this is the vitellus, within the vitellus is a small vesicular body—the Germinal Vesicle, containing the Germinal Spot, which measures from 1-3600 to 1-2400 of an inch.

The Graafian Vesicles, after approaching the surface of the ovary, burst, liberating its contents, which being caught by the fimbriated extremity of the fallopian tube, through which it passes into the Uterus. (This constitutes the most important part of the menstruation, which occurs every 28 days.) In the Foetus the ovaries are situated near the kidneys, in the lumbar region.

Arteries of the Ovaries and Fallopian tubes are the Ovarian from the Aorta. They anastomose with the termination of the uterine arteries, and enter the attached border of the ovary. The Veins follow the course of the arteries; they form a plexus near the ovary—the pampiniform plexus. The Nerves are from the spermatic plexus, the Fallopian tube receiving a branch from one of the uterine nerves.

The Mammary glands secrete milk, and are accessory to the generative system. They are greatly the largest in the female. They are large hemispherical eminences, one placed on each side, situated on the pectoral region, between the third and seventh rib, and extending from the side of the sternum to the axilla.

Before puberty they are small, developing with the generative organs, they increase during pregnancy, after delivery, and become atrophied in old age. They are external to, and separated from, the pectoral muscles by a thin layer of superficial fascia. Their outer surface is convex, presenting immediately below its center a conical, prominent emi-

nence the mammilla, or nipple, which is of dark color, and surrounded by an areola of rosy hue in the virgin. This areola becomes dark about the second month of pregnancy, and diminishes after lactation is completed, but it is never lost through life.

The nipple is slightly erectile when excited by mechanical excitement. Its summit is perforated by numerous orifices—the apertures of the lactiferous ducts.

The Mamma consists of gland tissue, of fibrous tissue connecting its lobes, and fatty tissue between the lobes. It is of a pale, reddish color, firm in texture, circular in form, flattened from before backward, and free from cellular tissue and fat. It contains numerous lobes, each composed of lobules, each gland having one duct, which terminates in the nipple. Their epithelium is tessilated. Fibrous tissue surrounds the entire surface of the breast, and sends down numerous septa between its lobes connecting them together.

Arteries supplying the Mammæ are from the Thoracic branch of the Axillary, the Intercostals and the Internal Mammary. The Veins describe an anastomotic circle around the nipple,—the Circulus Venosus. From this, large branches transmit the blood to the circumference and end in the Axillary and Internal Mammary veins. Lymphatics run along the lower border of the Pectoralis major to the Axillary glands.

The Nerves are derived from the anterior and lateral cutaneous nerves of the Thorax.

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ERRATA.

On page 32, "Sacro Umbalis" should be "Sacro-lumbalis;" page 38, "Right Carotid" should read "Right Coronary;" and a few typographical errors and mis-spelled words on the part of the printer, which will be apparent to the average medical reader.

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